The Meaning of Home Science

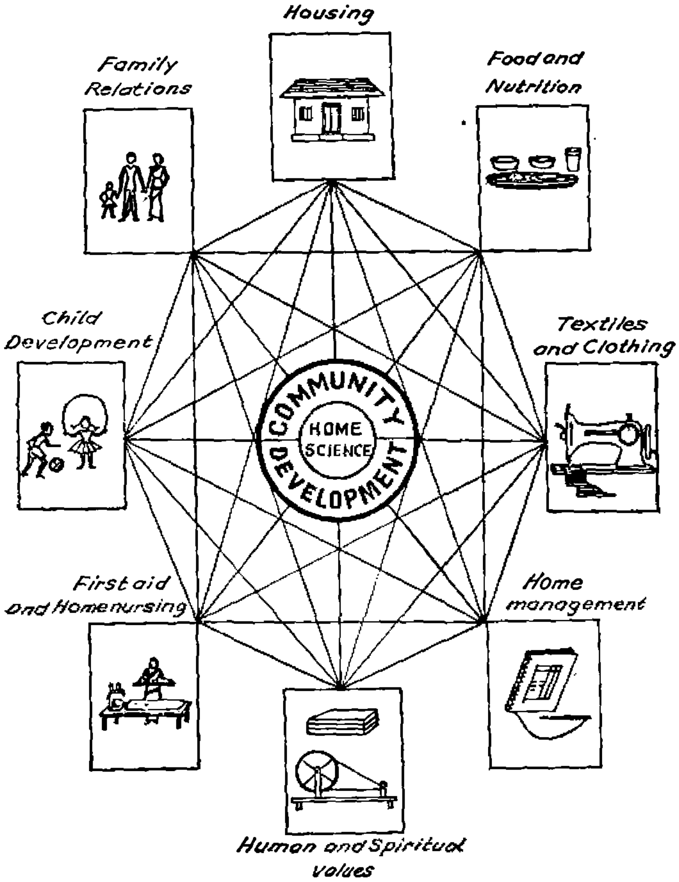


FIG. 1. The different components of Home Science

to lay the foundation for building happy homes ;

to prepare for future employment.

The different components of Home Science, as illustrated in Figure 1, are : Housing, Food and Nutrition, Child Care and Development, Human Relationships, Home Management, Textiles and Clothing and Home Nursing and First Aid. Spiritual and human values are the basis for individual family, community and national development, which is the goal of Home Science.

Housing. Good housing ensures the health and security which is the goal of Home Science.

Food and Nutrition. Good nutrition is important for healthy living. Health is essential for a happy family life.

Child Care and Development. Knowledge of how to take care of children and help them to develop physically, mentally and emotionally is essential for the members of the family.

Human Relationships. Getting on well with others in the family and community is an asset to personality.

Home Management. Proper management of the household means economical use of time and energy and other resources.

Textiles and Clothing. Knowledge of the aesthetic, hygienic and economical value of clothing is important.

Home Nursing and First Aid. Health is the key to happiness. In order to preserve it, skill in nursing the sick and ability to meet emergencies through First Aid need to be developed.

ASSIGNMENTS

1. Observe the activities in your home and list those which require additional knowledge for improvement.
2. Discuss the points in which you need training to be an effective member of your family.
3. Discuss and list the ways in which your home can help national development.

CHAPTER II

THE ART OF LIVING TOGETHER

IN popular expression, the words 'home' and 'house' are used as interchangeable terms, but their meanings are entirely different. 'Home' means more than 'house', which denotes only the physical construction. On the other hand 'home' means the family which is the social unit which comes into existence when a man and woman decide to make a common endeavour to satisfy their basic wants. A 'house' is a piece of architecture, a treasure house of personal belongings and an exhibition of individual tastes. The 'home' is the centre of family and social life, a place of happiness and comfort for the entire family in all stages and conditions of life. Just as food, clothing and shelter are essential to life, love and kindness which people receive in the home are far-reaching in their effects on personality development.

The 'home' is the place where a good part of one's time is spent. It is a place of peace and quiet, where members achieve fulfilment, and where children grow into adulthood and perpetuate the life cycle. Home life, therefore, is the fulfilment of a nation's aspirations and the foundation for its prosperity. The home plays a very important role in training good citizens.

The Characteristics of a Good Home.

A good home is a place where its members

1. can grow physically, mentally and spiritually;
2. can rest, feel secure and have adequate privacy;
3. be themselves;

4. are ensured of an atmosphere conducive to the full expression of their personality;
5. feel free to extend hospitality to friends;
6. share in the work, recreation and other activities of the family;
7. have abundance of affection and goodwill.

A good family imparts to its members spiritual security, emotional satisfaction, a sense of values, protection, food, shelter, clothing, education and other necessities. It facilitates the mutual adjustments of several individuals in personal, economic and affectional aspects. In order that the members of the family may find joy in home life, they need to develop good work habits. The success of the venture of home-making depends mainly on how the members of the family feel and work together for the common good. They must remain healthy, both physically and mentally, since family happiness grows with good health. Harmony in the home is possible to the extent to which these objectives and adjustments are achieved. Besides environment, the attitudes of the individuals and the interplay of these attitudes in the family will determine how far home life will be happy and successful.

Affection is fundamental to human happiness. In a family the basic need for love must be satisfied if its members are to develop a sense of security, 'belonging' and co-operation. The individual must feel adequate in order to inculcate faith in himself. The members of a family must learn to co-operate with one another and share joys and sorrows. They should take care of the property in the home and help to maintain standards and traditions of the family.

Assignments

1. List the duties of the mother, father and other members of the family in your home.
2. Discuss the specific ways in which co-operation and harmony can be fostered in your home life.
3. Collect proverbs pertaining to home and family life in English or in your language.

CHAPTER III

HOUSING

ADEQUATE housing is essential for decent and meaningful human existence. Primitive man was content with some space to lay down his body. His only consideration was to provide for himself shelter from the weather and protection from wild animals. However with the march of civilization, life has become complex. The average modern man needs one room for work, another for rest and another for social occasions. In general, the objective in present day housing is to provide each member of the family with his or her own room. Naturally, this ideal can be achieved only by the rich.

THE FUNCTIONS OF THE HOUSE

The house is a dwelling unit. It may have a group of rooms, or a single room, occupied or intended for occupancy. It may consist of separate living quarters or a flat with other dwelling units.

Whatever be its form, the house is the centre of family life. It provides space for group and individual activities of the members of the family, such as recreation, reading, shared experiences and hospitality. It offers facilities for the members for study, rest, sleep, concentration or meditation. It meets the needs for activities such as cooking, serving meals, washing, house cleaning, storage of supplies and equipment and the disposal of waste. It provides space for children's play and for adult or adolescent hobbies. It facilitates the storage of miscellaneous household goods, such as play things, boxes and luggage. The function of the house is to provide for all these essential activities necessary for the fostering of harmonious family life.

Whatever the type of house, whether rural or urban, the essential requisites are : a good site and aspect : fresh air and ventilation ; adequate water supply and a convenient arrangement of the available space. If we had our choice, most of us would probably opt to live in a village which is not far from a big city or town. There we could enjoy the beauty and freshness of the countryside as well as the advantages of city life, such as, education, social life and entertainment. But most families have no choice in this matter. They have to live where they can afford to and find a place which is often where they work.

LOCATION

A good location is one where the neighbourhood is clean, communications are available and access to one's place of work, school and markets is easy. A house cannot be said to be in a good location if the surroundings are unhealthy through overcrowding, the presence of factory smoke, open public drainage or heavy traffic and noise. The governing bodies of big cities, namely, the Corporations and Municipalities of towns, should see that factories and drains are so located that the prevailing wind carries away all unhealthy odours from the residential areas.

SITE

A good site is one that provides a firm, dry foundation for a house. *Rock* makes a firm foundation, but sometimes holds water in hollows, which should be filled.

A Gravel Site is good, as water runs through it quickly.

Sand also lets water run through it very quickly. Therefore very deep foundations are needed, if a sandy site is chosen.

A *Clayey Site* is unsuitable, because clay holds water for a long time. If the house has to be built on clayey soil, a deep channel should be dug some distance round it, or loose-jointed porous pipes, into which the water will drain and be carried away (Figure 2), should be laid in the ground around the house.

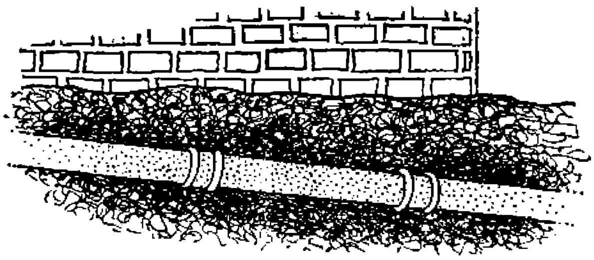


FIG. 2. Loose-jointed pipe

THE ASPECT OF THE HOUSE

The *Aspect* is the direction in which the house faces and which has the most openings, that is, doors and windows. In a tropical country, people need a cool aspect and in a cold country, a warm one.

Generally speaking, in India and in the countries which are north of the equator, the north is the coolest aspect. The south is cooler than the east or west in India because by the time the sun reaches the south it is too high up in the sky for its rays to enter a house protected by a verandah. The east is hot in the morning, and the west in the evening. The south-west is generally the hottest of all. But the prevailing wind and local conditions must also be taken into consideration. If the north faces a burning desert over which a fierce wind blows, or the south-west a broad river or the sea from which cool breezes enter the house, these normal conditions may be reversed. In order to derive the maximum advantage from a good aspect, the chief consideration is not where the front entrance is to be located but where the largest number of living rooms are situated. It is good for sunlight to enter the house during some part of the day, because it is one of the best purifiers of nature.

NUMBER AND ARRANGEMENT OF ROOMS

The convenience of a house depends on the arrangement of the rooms. Through careful planning, the rooms in which a series of activities pertaining to one major activity or area are carried out, for example, food, can be placed together. Since food storage, preparation and service go together, it will be necessary to plan to have the kitchen store room and dining room close to one another.

VENTILATION

(Good ventilation means adequate supply of sunlight and fresh air into the house to promote comfortable and healthy living.) Effective ventilation is achieved by maintaining the desirable ratio between air measurements going inside and coming out, expressed as a percentage.

For good cross ventilation, windows should be built on walls facing each other. If windows are provided on only one wall, one wide window or two windows at the corners should be preferred.

Assignments

1. Which aspect is the best for houses in your locality? Give reasons.
2. Is the building ground available in your neighbourhood composed of rock, gravel, clay or sand ? On what kind of site is (i) your house and (ii) your school or college built ?
3. Examine your own house and find which room is the coolest (i) in the early morning and (ii) in the afternoon.
4. Are the mills and factories, if any, in your town placed where they will do least harm to the inhabitants ?
5. Make a study of your house, considering its surroundings, and the number, size and arrangement of its rooms. Examine whether it could be made more convenient through changes in the arrangement of rooms.

CHAPTER IV

HOUSING SCHEMES AND COLONIES

HOUSES in India are of many types. They range from the small huts in the village or the tenements in the city slums to the mansions, bungalows and flats in multi-storeyed skyscrapers.

Since 80 per cent of the population of India live in the villages, rural houses can be considered as typical of the Indian housing system. They may be one-roomed, two- or three-roomed. A few are even multi-roomed. Urban houses, on the other hand, generally have a number of spacious rooms, with good ventilation and electricity. Some may even have broad verandahs.

Soon after Independence, the Government of India found many families living in houses which were inadequate in space, light and protection from rain and wind. Since then, the Central and State Governments have taken remarkable steps through the successive Five-Year Plans to improve housing conditions. Many of the schemes described below have been initiated mainly on a co-operative basis.

1. *The Subsidised Industrial Housing Scheme.* The Subsidised Industrial Housing Scheme was introduced in 1952 to extend financial assistance to the State Governments, and through them to approved agencies, such as statutory housing boards, local bodies, industrial employers and registered co-operative societies for the construction of houses for industrial workers.

2. *Low Income Group Housing Scheme.* The Low

CHAPTER V

THE HOUSE AND ITS SURROUNDINGS

MOST houses have very little space around them. Thousands of families in big cities, such as Delhi, Bombay, Madras and Calcutta, live in flats in crowded localities without any extra space for a garden. Some are forced to live in old types of homes which may not cater to modern trends and tastes. A large part of our population lives in the villages. If their houses do not adjoin they may be fortunate enough to have some open space around their homes.

The surroundings of houses include gardens, courtyards, quadrangles and other buildings. The garden is the cultivated ground surrounding a part or the whole of the house ; the court is the paved enclosed space at the side, front or inside of the house ; the yard is the enclosed area

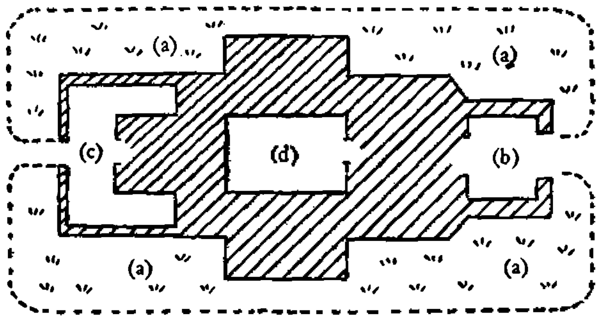


FIG. 3. Floor plan of house : (a) Garden ; (b) Court ; (c) Yard ; (d) Quadrangle.

found at the back of the house ; while the quadrangle is built within the house itself (Figure 3).

These surroundings can be planned to serve beauty, utility and health.

Beauty. Even in the busiest, crowded and poorest residential sections of a town, where space does not permit gardens, much can be done to beautify the surroundings. The municipality can contribute much to this end by planting trees, laying out gardens and playgrounds, and letting out small areas of waste land to private individuals to turn into gardens. Citizens should vote for such officers who will work for the beauty of the municipality. The people themselves can help by clearing away disfiguring heaps of rubbish or broken walls or tumbled-down houses.

One of the most delightful activities is gardening. Gardens vary according to climate, nature of the soil, water supply, the time and individual tastes of the gardeners. Some gardens may be beautiful with green lawns, others with wide-spreading shady trees and beds blooming with flowers of varied colours and shapes for the greater part of the year, and even some in which a few coconut or other palms give shade. A few may have a wide stone fountain in the centre or bright flaming creepers climbing over old brick walls. Concepts of beauty in gardens vary as much as ideas of beauty in house furnishings or clothes.

Whatever the concept may be, beauty in a garden must be in harmony. In large gardens, a part may be kept wild, but its wildness must submit to order. Everywhere in the garden, undergrowth must be cut away, paths and beds kept free from weeds, hedges cut trim and neat, and no disfiguring heaps of stones or rubbish permitted to accumulate. A trim hedge may hide from view such spots as manure pits, gravel heaps and tool sheds which are necessary but not artistic.

Courtyards and quadrangles, if well kept, add much to the beauty of a house. But too often quadrangles are dumping grounds for unsightly heaps of rubbish, worn-out cooking utensils, dirty rags and piles of broken furniture. Courtyards often shelter badly-kept cowsheds and carelessly piled supplies of fuel or broken parts of carts, carriages or wagons. Weeds spring up everywhere, while pools of water and perhaps even open drains add to the unpleasantness of the general appearance and unhygienic conditions.

All articles in a home not in use and those in need of repair as well as fuel supplies may be stored in cupboards. Whatever is in use, if kept clean to serve a definite purpose—whether it be a cowshed, a carpenter's bench or a spinning wheel—has an attraction of its own ; but as soon as it ceases to be of use or is neglected, it becomes an eyesore. Small palms or other plants in tubs or pots, a *tulsi* pot and a small fountain or pool, add to the beauty and delight of a quadrangle. It is worth remembering that the beauty of a courtyard or quadrangle is artificial and not natural. Therefore attempts at enhancing its beauty must also be of the same character.

Utility. A garden ensures fresh air and privacy. It provides space for exercise, play and games, all of which are beneficial to people of all ages. The garden produces flowers for worship and decoration, and vegetables and fruit for food.

Even in a small garden one can grow a row of papayas, a clump of plantains, a lime tree, a drumstick tree and some beds for whatever vegetables may be in season. In a large compound almost everything needed for the family can be grown. Fruit trees and vegetables are beautiful to look at and their produce tastes better, and is fresher than what can be purchased in the market. Therefore families should make greater use of their gardens to produce protective foods, utilising fully the assistance available from the agricultural departments, such as improved seeds and technical guidance.

The quadrangle gives useful air space and often can serve as an extra room. The verandahs round the quadrangle are useful for domestic and social purposes. Yards and courts can be used for storing fuel, for home laundering, carpentry, children's play, and other household activities.

Health. The surroundings of a house can safeguard health if kept clean. Without cleanliness in the compound and surroundings, one would be better off without a compound, since two of our deadliest enemies, the mosquito and the housefly, breed in dirt. If flies are seen in a house, there must be dirt on the ground nearby. If there are mosquitoes, there must be stagnant water or moist undrained ground in the neighbourhood, because neither of these two insects travel far from their breeding grounds for food. How, then, can we keep our surroundings healthy?

If there are open drains in the public street, which are not kept scrupulously clean, approach the authorities. Keep your private garden and surroundings clean. Do not allow water to accumulate in hollows. If there is open water treat it as described in Chapter 9. If the house is built on damp, marshy ground use open-jointed drain pipes throughout the garden to combat mosquitoes. Do not ignore thick undergrowth since it serves as a hiding place for snakes. Heaps of stones should be avoided for they house scorpions. Do not allow rubbish to be thrown on the ground, because flies, though they prefer body wastes in which to lay their eggs, can make use of any damp decaying animal or vegetable matter in which to breed. Do you yourself ever throw rubbish on the ground ? Are there accumulations of dead cabbage leaves and skins of any kind in any corner of your compound? If they are left even for a day, they will detract from the beauty of the garden and attract swarms of flies.

Accumulation of rubbish and broken furniture in quadrangles, courts and yards is unsightly and unhealthy. They collect dirt and allow disease germs such as those of tuberculosis to multiply. Insects such as bugs, rats and scorpions breed there. These wastes can be used instead to prepare compost pits.

How to Make Compost. Vegetable compost is prepared by collecting weeds, dry leaves, peels and other vegetable wastes. These are deposited daily in a pit dug for this purpose. They are placed in layers, and cow-dung solution is sprinkled as a starter, followed by the sprinkling of water to maintain moisture.

This process should be continued till the pits become full and the weeds can be piled up to 23-25 cm. above ground level because when decomposition sets in, the contents sink. The compost then becomes level with the ground. Thereafter the deposits can be covered with mud, and stirred after a month. The compost thus prepared can be used after six months.

Animals in the House and its Surroundings. Some families rear cows, buffaloes, goats or poultry. Horses are also kept by some people. The wise housewife will never leave the care of animals and their dwellings entirely to others, for she knows that the health of her household depends on the maintenance of sanitation in the animal sheds and in the proper disposal of their body wastes. The dangers arising from neglected stables or cowsheds are the depressing effects caused by the presence of body wastes, the diseases they can cause to those who live nearby, and the opportunity they give to flies to deposit their eggs.

Body wastes of animals can be put to two good uses : (1) Cattle-dung may be mixed with mud and used for smoothening the surface of earth floors ; and (2) compost can be made into manure for fertilizing the soil, enabling it to bear greater produce. This is the best use of animal wastes. However, cow-dung is most commonly used as fuel. This practice leads to one of the biggest wastes in our community, since the precious manurial matter is lost by burning cow-dung.

Stables and sheds should have dry floors and adequate ventilation and protection from rain. They should be washed daily with clean water, which should run into a drain or a trench outside the shed, to be distributed over the garden soil thus adding to its productivity

It is not practical to keep big animals, such as buffaloes and cows, in towns where space is limited. In some towns keeping cattle is strictly forbidden by law. However, in many towns in India, a family needs to depend on its own animals for its milk supply. Therefore, if the precautions described above are observed, one or two animals may be kept in the backyards of private houses.

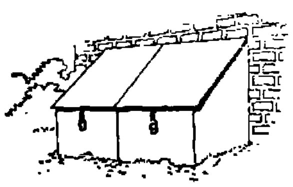


FIG. 4. Covered bins

Another danger may also arise sometimes from keeping animals. If their food is carelessly stored and grain is scattered where they are fed, rats will be attracted. Covered metal bins (as shown in Figure 4) can be used. Regular and careful sweeping can help to overcome this danger.

Poultry Houses. Many poultry keepers provide a layer of deep litter consisting of heaps of material, such as wheat straw, paddy straw and groundnut husk for the flooring of the house. A six-inch layer of litter on the floor will help to keep the birds comfortable and contribute towards increasing the production of eggs. The deep litter material may be kept undisturbed even for six months. However, the deep litter should be kept dry to avoid getting caked. After six months it can be changed. The old litter makes very useful manure.

Poultry sheds and runs which are not maintained with deep litter should be swept at least once a week. Their wastes should be buried and stored for ready use as manure.

All the places used by animals should be washed with freshly slaked lime at least twice a year, and a disinfectant poured down their drains once a week.

Assignments

1. List the important factors to be considered in assuring good surroundings for a house.
2. Examine the surroundings, gardens and quadrangles of your school and home, with reference to their (a) beauty, (b) usefulness and (c) effect on health. Set right what is unhealthy and ugly. How can you increase the beauty and utility of your surroundings ?
3. Describe a beautiful garden and plan a flower garden in front of your school.
4. Discuss the satisfactions and advantages of a vegetable and flower garden.

5. Give an annual plan for the vegetable garden to have vegetables throughout the year.

6. If your house has a compound make a list of (a) the vegetables, (b) the flowers and (c) the fruits that can be grown during the different seasons of the year. Cultivate them and assess your progress.

7. If your house has no compound wall, grow a suitable hedge, and keep it trimmed to a proper height.

8. If your house is small and has no space for a garden, try growing plants in pots and window boxes.

9. Observe the animals kept by the families in your neighbourhood and the sanitation of their dwelling places.

10. Make drawings of sanitary poultry houses and cowsheds. List the materials suitable for floors and accessories.

CHAPTER VI

VENTILATING THE HOUSE

Is your house well ventilated? Does plenty of air pass freely through it?

What is air? Air is matter in the form of gas. It is composed of a mixture of gases—oxygen (nearly one-fifth), nitrogen (nearly four-fifths), a tiny amount of carbonic acid gas, a little argon (about 1 per cent), a varying quantity of water vapour (generally from 1 to 1½ per cent), traces of other gases depending on locality and various tiny particles of solid matter. Of all the ingredients of air, oxygen is the most important. It is necessary for the life of all creatures. Without it fire cannot burn or produce light. A very strong pure form of oxygen is called ozone. There is plenty of ozone near the sea.

Nitrogen in the air seems to have no particular active role for human beings; it serves to dilute (i.e. to render weaker) the oxygen which, if undiluted, would be too strong. Carbonic acid gas and most of the other gases found in the air are impurities. They enter the air from factories, household fires and lamps, the breath of human beings and animals, and from drains and other waste matter.

Carbonic acid gas (also called carbon dioxide) is the product of breathing or of burning. Conduct the following experiments to understand the nature of air.

EXPERIMENT 1. *To show that carbon dioxide is breathed out from the lungs.*

Breathe through a tube into a glass vessel filled with clean lime water. It will turn whitish due to the carbon dioxide you have breathed out.

EXPERIMENT 2. *To show that a greater quantity of carbon dioxide is produced with rapid exercise.*

Skip vigorously for five minutes and breathe again into the lime water. What do you observe? Try to explain the reasons for the change.

EXPERIMENT 3. *To show that carbon dioxide is a product of burning.*

Light a candle. Hold an inverted glass jar over it for a minute. Quickly remove the jar and pour lime water into it. It will turn whitish through the presence of carbon dioxide produced in the air by the burning candle.

EXPERIMENT 4. *To show the presence of oxygen in air.*

Take a small piece of white phosphorus in a crucible lid and cover it with a bell-jar. Kindle the phosphorus by a hot glass rod. Dense white fumes of phosphorus pentoxide are produced. Oxygen in the air has combined with phosphorus and produced phosphorus pentoxide.

A heavy intake of carbon dioxide causes the spleen, which is an important organ in the body, to become enlarged. Carbon dioxide is useful to plants, although it is harmful to human beings. Animals breathe in oxygen and give out carbon dioxide, while plants absorb carbon dioxide and use it to manufacture starch under the influence of sunlight and give out oxygen.

Far more dangerous a gas than carbon dioxide is carbon monoxide which is a product of incomplete burning of charcoal. It is also given off from the surface of heated cast-iron stoves. Therefore, always keep the windows open when burning charcoal.

Have you ever seen particles of solid matter floating about in the air ? You must have seen them in a room into which the sun was shining through a tiny hole or crack.

You could not have counted the number of particles thus made visible. How do such particles get into the air? When cloth gets thin or any solid matter wears out, the worn out particles pass into the air. Light dust and sand also enter the air. Near a cotton mill or coal mine the air is full of such solid particles and impurities.

There is always some water vapour in the air. The amount of water vapour present in the air, compared with the amount of water vapour it can hold, is called *relative humidity* (humidity means dampness). How does water vapour get into the air? You know that evaporation, that is, water turning into vapour, is going on constantly from the surfaces of water. That vapour merges with the air.

Conduct the following experiment to detect the presence of moisture in the air.

EXPERIMENT 5. *To show that moisture is present in the air.* Put a lump of ice into a glass. Observe the outside of the glass. Are drops from the melted ice making their way through the glass? No, the air outside being made colder through the presence of the ice deposits some of it on the glass, because it cannot hold all the water vapour condensed. When water vapour turns into liquid it is said to be condensed.

Cold air cannot hold so much moisture as hot air. When air can no longer hold any more moisture it is said to be *saturated.* Air does not soak up moisture. Only particles of vapour mingle with air particles. The temperature at which air begins to deposit moisture is called the *dew point.*

A certain amount of water vapour in the air is good for human beings. Islands generally have a damp climate. Do you know why? Yet Great Britain has quite a healthy population, and New Zealand, made up of islands, is said to be the healthiest country in the whole world. Either very cold or very hot air makes life uncomfortable. They are bad for health. One feels depressed and breathing is often affected. Very dry air is also bad since the moist lining of the nose and throat becomes too dry as does the skin.

Fresh, clean air is of the greatest importance to health. The air in cities and factories is filled with impurities. Because of the diffusibility of gases, these impurities become scattered and spread everywhere.

We have seen that the air in inhabited houses becomes impure through the breathing of individuals and burning fuel in fires or in lamps. If such impurities are to be removed, air must have free entrance and exit ; it must also be able to circulate freely in the house. Foul air must be allowed to pass out, making place for fresh air to enter. In every room and in every quadrangle and passage, a through draught, that is a direct passage through which air can pass in and out, should be ensured.

In the same house, there may be a direct passage in some rooms and not in others. If possible, every wall in a room should have at least one opening, preferably a door, or at least a window. In cold climates, a chimney is also essential in every room.

How much air does a person need ? Each person should have eighty-five cubic metres of fresh air every hour. Some people can get on with less, especially if the air is not too humid. Measure in metres the three dimensions of the room you are sitting in. Multiply them to get the volume of air in cubic metres. Divide the number obtained by 85. The answer will show the number of people who could comfortably stay in that room for one hour, if all the doors and windows and openings of every kind were closed.

Fortunately, in the tropics doors and windows can be kept open all day and all night, except perhaps during the afternoons in hot weather. If they are closed, an open space high up in the wall should be allowed for the escape of bad air, and one door or window should be kept partly open for the admission of fresh air.

In cold countries, where people cannot sit all day in draughts, one window at least should always be kept open, or special openings, called *ventilators*, should be supplied (Figure 5). Air heated by the addition of the breathed air or by burning, rises and passes out through the top ventilators, and cool fresh air from outside passes through the lower opening.

Why does the heated air rise ? The effect of heat on all substances is to expand them, that is to make them larger in volume, and therefore lighter in weight per cubic unit. When the same weight expands in volume, the weight per unit volume becomes smaller. Therefore if two equal volumes of the same substance, one hot and the other cold, are weighed the heated one will be the lighter. Therefore it will rise. On the other hand, cold contracts those that are cold making them smaller in volume. The lighter hot air thus rises and the heavier cool air comes in to replace it. It will be better if the cool air can come through the room

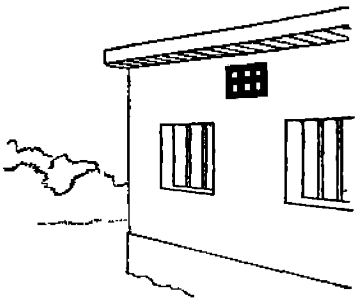


FIG. 5. Ventilator

at a lower level; but if it cannot, the cooler particles of air will push downward and pass the warmer ones as they rise.

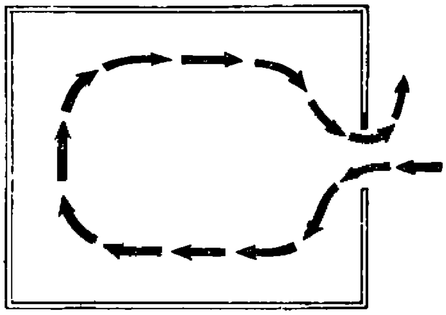


FIG. 6. Air Circulation

Thus circulation (the process of going round in a circle) of air results, as shown in Figure 6.

The old types of houses were built on a good plan with regard to ventilation. The living rooms were built round a central open quadrangle, with one verandah round the quadrangle and another right round the outside of the house. The rooms had doors and windows opening on to both the verandahs. When they are kept wide open, especially in the direction of the prevailing wind, the ventilation is excellent. But if the doors and windows are not kept open, there will be no through draught and the air in the quadrangle will get stale. The heated, stale air will rise, but no fresh air can get in from outside ; only more stale air, mixed with smoke from the kitchen, will seep through cracks in doors, walls and windows.

People living in such houses are often pale and unhealthy because of lack of fresh air which really costs nothing. If you live in such a house, you must see that the doors and windows opposite one another are kept open frequently. If there are no doors and windows, do your best to have them made. The higher the house, the greater the ynecessit for plenty of ventilation at ground level.

It may happen that the air outside is not very good because of over-crowded buildings, factories pouring out smoke, heaps of decomposing vegetable matter, or open drains running along the street. Even such air, however, will be fresher than what is inside, because it changes when the wind blows, and when the heated air rises, fresh air from the surrounding area takes its place.

Some people live in houses supplied with plenty of good air, but cover up their heads when they sleep, through fear of mosquitoes. They shut all windows for fear of thieves, and thus breathe bad air for about eight hours out of every twenty-four. Never cover your face. Use nets to keep out mosquitoes and iron bars to keep out thieves.

Assignments

1. Observe, in your house and school buildings, the provision made for ventilation. Discuss their adequacy in class.
2. Find out and record three examples about the evolution of carbonic acid gas in everyday life.
3. Show the composition of air graphically.
4. Name the chief impurities found in air.
5. Observe how people sleep in cold places like Mysore, Coorg, Hyderabad, Nilgiris, Darjeeling, Nainital and Simla.
6. Test the temperature of identical rooms (i) left open, (ii) closed, (ii) partially closed with wet *tatties* or curtains.
7. Why are ventilators placed high up in walls?
8. Does hot air hold more moisture or cold air? Does moving air hold more water vapour or still air? On which day, a hot or a cold one, do clothes dry more quickly? Why? Again, do they dry more quickly in wind or in still air? Why?

CHAPTER VII

COOLING AND WARMING THE HOUSE

FOR comfort and efficiency in work, the heat in the house needs to be regulated to be made warmer or cooler, as the case may be, than the surrounding atmosphere. In India, situated in the tropics, with the greater area consisting of plain or tableland at a low elevation, cooling the house is a more frequently felt need, although in the snow-capped Himalayan region, warming the house is absolutely essential.

COOLING THE HOUSE

A house can be cooled in three ways : (1) by excluding hot air, (2) by admitting cooler air and (3) by circulating the air.

By Excluding Hot Air. In the hot weather, early in the morning, when one enters the house after walking in the compound, one will notice at once how hot the air inside the house is. The position will be reversed after a few hours of sunshine. The sun warms not only the air, but also the ground, which by reflecting its heat warms the atmosphere almost as much as the rays of the sun itself. One way of keeping the house cool, therefore, is to select the right moment when the air outside is not warmer than that inside, and close all doors and windows. Then the air within will keep considerably cooler than the air outside. However, the air is not as good inside as it is outside. Therefore it needs to be renewed from time to time from the outside. Otherwise, it will soon become polluted and exhausted by the people breathing it. That is why ventilators are placed in the walls of a room. If there are no ventilators in the house, the rooms should be opened two or three times during the time they are closed ; otherwise, through want of fresh oxygen, weariness and headache will result. In a closed room, a fan cannot refreshen the air ; it can only circulate it in the room. Split bamboo or cane blinds or *tatties* hung round the verandah can also help to keep the house cool.

By Admitting Cooler Air. Since evaporation produces coolness owing to the loss of heat which occurs when a liquid passes into vapour, this principle can be made use of when the ground far round the houses is watered, or *khus-khus tatties* or similar blinds are hung in front of the windows and doors, and kept moist. As the moisture exposed to the heat of the sun evaporates, the air which percolates through the blinds into the rooms is thus kept cool. This is a much better method of cooling rooms than shutting up the stale air inside. Moreover, the little moisture that comes in is always desirable, since a very dry air is not good unless the climate is damp. The only objection to this method of keeping rooms cool is the labour involved. The water thrown on the *tatties* dries up rapidly and needs constant replenishing. Therefore, this method is good for keeping the rooms cool only when labour and water are plentiful.

The principle of the *khus-khus tatti* may be utilized in the following way without involving any labour. Place inside the room, at the top of a window, a tin vessel made to the same size as the width of the window. It may be supported on bamboo legs or on small brackets, and painted the same colour as the window frame. At the bottom of the tin, make half-a-dozen pin-prick holes evenly spaced. Beneath the tin, hang a curtain of thick absorbent cotton cloth the same size as the window, so that the top of the cloth lies just under the holes. Fill the vessel with water. Drops will fall on to the curtain fast enough to keep it wet and cause constant evaporation resulting in coolness. If one or two windows or doors in a room are treated in this manner, the rest may be kept closed. The room will be found to be considerably cooler than if it is entirely closed. A fan near the wet curtain will drive the cool air into the room at the same time, admitting fresh air constantly, thus enhancing the cooling effect.

By Circulating the Air. The body is a producer of heat at a constant temperature of 36.8°C. Therefore, when the air is kept in motion, the air which is cooler than the body is brought into constant contact with it, causing a feeling of coolness. When the body perspires, the moving air absorbs and carries away the moisture of the sweat. Thus, in both these ways, coolness and comfort are produced.

The motion of the air may be caused by hand-pulled *punkahs* or by hand-fans or by circular fans worked by electricity. The heat generated by the electric power in operating the fan raises the temperature of the room slightly, but not enough to do away with the advantages derived. People who have the means can keep blocks of ice in their living rooms, or install electrical air-conditioning to lower the temperature.

WARMING THE HOUSE

In cold climates, the most common way to heat rooms is by the process of combustion. Combustion generates heat through the burning of combustible substances which may be solid, liquid or gas. Another way of warming a house is by heating through electricity some device that will radiate heat. Care should be taken to see that the living rooms are not kept at a temperature higher than 30°C and that the bed rooms are cooler.

Open Fires. The open fire is one of the most common methods of warming the house. A fireplace is built in the centre or a corner of the room against a wall with incombustible substances, such as iron, stone or brick. A chimney from it runs up and through the roof (Figure 7).

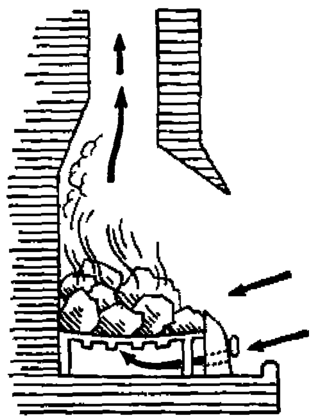


FIG. 7. Fireplace

Originally, a fireplace used to be built in the middle of the room with a hole made in the roof through which the smoke made its way out. Wind or rain, however, might enter the hole, to the great discomfort of the occupants below. Later, the chimney was added effecting a great improvement in house comfort.

A chimney is essential for either an open fire or a closed stove for the cleanliness of the house and the comfort and health of its occupants. Even when a chimney is provided, smoke in the room may be caused by insufficient space in the outlet, an insufficient upward draught, or an adverse wind driving it back into the room and by soot deposits clogging the chimney pipe. An insufficient outlet can be rectified by widening the chimney. The draughts can be regulated by effecting the additions or alterations in the construction. Often the chimney is not high enough and sometimes it is overshadowed by some higher buildings or trees. Periodical cleaning of the pipe will avoid the deposition of soot. Using porcelain pipes with smooth inner surfaces will also help.

An open fire is the most cheerful of all fires, but it generally means dust, dirt, labour and soot. The fuel used for open fireplaces are coal, coke, which is coal partially burnt with the gas driven out, peat, which is partially compressed decayed vegetable matter, and wood. Which of these is to be used depends upon availability and cost. Wood is most commonly used in our country. It provides a cheerful fire, can be cleanly stored, is less expensive and burns quickly giving out good heat. However, since wood burns very quickly a great amount of labour is involved in chopping and replenishing it. Coal has good heat value and is inexpensive to people who live in and around coal-mining areas. When soft, as is generally the case with household coal, it is a source of much dust and ash. Coke is also valuable for generating heat, is clean, but needs frequent attention. Peat has generally the qualities of wood and is not very expensive. The grate of the fireplace should be kept clean always and the ashes must be cleared frequently.

Closed Stoves for Burning Solid Substances. A stove is a receptacle in which substances are burned for the production of heat. It may burn any of the substances mentioned above as well as charcoal, which is partially burnt wood. Large stoves must be fixed with a stove pipe entering a chimney (Figure 8) or leading out of doors, to carry off the poisonous fumes which are products of combustion. Small stoves such as charcoal stoves (Figure

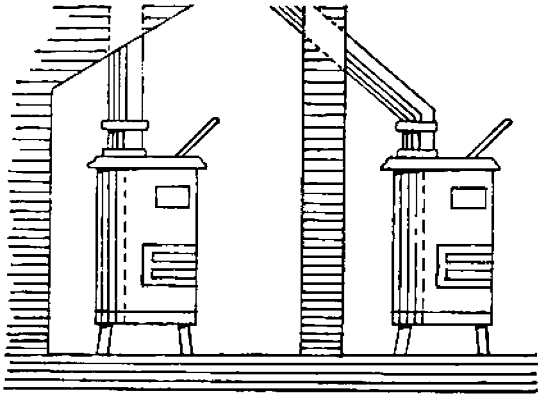


FIG. 8. Stove and stove-pipes

9) may be moved wherever they are needed, and are not provided with a chimney. However, in such cases a window must be kept open to let out the poisonous gas. There are instances of people sleeping in a closed room heated by a charcoal stove dying of suffocation within a short time.

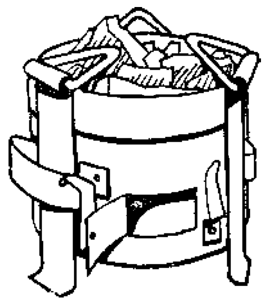


FIG. 9. Charcoal stove

Kerosene Oil Stove. Kerosene oil stoves have good heat-producing values, but care is needed to keep them clean. Otherwise, smoke and oil fumes will result and contaminate the air.

Gas Stoves. Gas stoves give good heat and can be regulated easily. There is, however, the danger of turning the burners too low, and a puff of wind may blow out the flame; the gas will then escape and even a little gas mixed with air becomes highly explosive and poisonous. Gas quickly consumes and dries up the air. So water should always be kept in a shallow vessel above the stove which should be connected to a chimney so that the gas fumes may escape.

Electric Radiators. Electric radiators are very convenient, safe, clean and give good heat, but the amount of electric current consumed is very great and they are therefore expensive. They are dangerous when the insulation and connecting wires are not laid properly.

Central Heating. In cold countries, a large stove is kept burning in the central part of the building, generally in the cellar. From this, pipes carry heated air, water or steam to every room in the house.

Assignments

1. Describe the methods of transmitting heat in an ordinary house.
2. Observe how the houses in your locality are cooled.
3. Study the types of heaters and coolers available in the market.
4. Collect pictures of different chimneys.

CHAPTER VIII

THE KITCHEN

ONE of the pressing needs of modern society is to have well-lighted, well-ventilated and well-equipped kitchens where smoke and dirt are absent. The kitchen is not only a work centre but also a social centre, a family room and the focal point around which several home activities revolve. In India, the kitchen is the heart of the house where the housewife spends three-fourths of her working time. It is her workshop for sixteen to eighteen hours of the day. But often this is the most neglected part of the house, because while constructing a house, engineers and builders often overlook the requirements of a well-planned kitchen.

In the advanced countries of Europe, the United States of America, Australia and Japan, a great deal of scientific research has gone into planning and equipping kitchens. Therefore the kitchen is built and maintained as one of the most attractive parts of the house. Absence of smoke keeps the walls and roofs free of spots. The floor is kept so clean that one hates to soil it. The walls are painted in pretty colours and spotlessly clean and gleaming utensils are hung on them. All these make the housewife proud of her kitchen. Every housewife in India also welcomes such a kitchen. But dark smoky kitchens are the common sights of today. Her dream can come true only by wise planning and designing, careful construction and useful equipment. Whatever the size or type of kitchen, every house must have a separate kitchen where the cleaning, preparing, cooking and serving of food can be done comfortably.

Primarily, the kitchen should be made as attractive as possible. This will help to make the daily drudgery of housework pleasant and easy, and will enable the woman of the house to have leisure for other activities as well as to be proud of her spotlessly clean kitchen.

In the joint-family system, it has been a common practice for all the senior women to attend, together, to the cooking, leaving the cleaning to the younger members or family servants. Times are changing fast and the joint-family and common kitchens are giving place to smaller kitchens for smaller families, where the housewife works without the assistance of servants. Therefore, great care needs to be taken to bring efficiency through labour-saving devices and neatness without having to battle with smoke and dirt.

SEQUENCE OF WORK SPACES AND ORDER OF WORK IN THE KITCHEN.

A comfortable kitchen is a result of careful planning of the work spaces. In the kitchen, two important functions are performed : (i) the cleaning, preparing, cooking and serving of food and (ii) the washing and putting away of utensils. To these may be added household sewing and the care of children as well. In order that the cleaning and preparation of food can be facilitated, the equipment must be arranged in the right sequence to save labour.

In order that all the activities in the kitchen are carried out smoothly, the kitchen should have the preparation, cooking and cleaning centres adjoining each other, located at comfortable working heights so as to form a work triangle for convenient and efficient labour (Figure 10).

The exact planning of these centres will depend upon the plan of the kitchen and the space available. The basic kitchen plans, U-shaped, L-shaped, the two-wall plan and

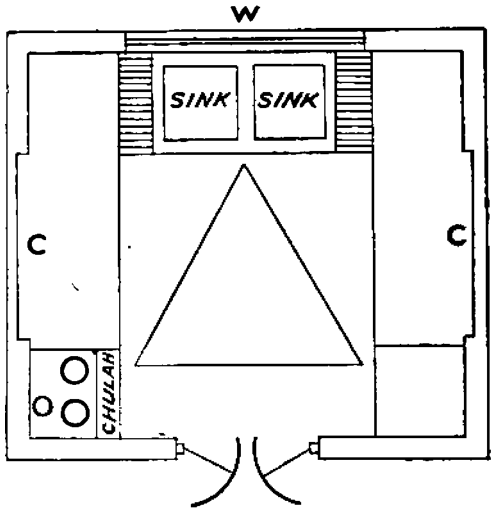


FIG. 10. Work triangle

the one-wall plan, can be modified and adapted to the size and shape of any kitchen and to the specific needs and work habits of the housewife.

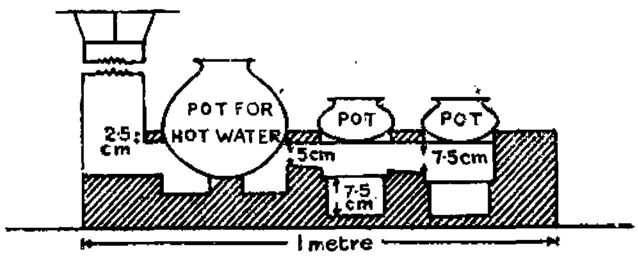
Provision for storage in the kitchen is very important. The space under work areas can be used for the storage of particular articles needed in those centres. The store-cupboard and safe should be easily accessible, and should be on the cool side of the room. Water for washing the utensils and for cooking food, and the place for grinding must be close together. Next in line should be the stove, *chula* or *sigri* for cooking and the fuel must be within easy reach. Utensils, such as the *thawa*, frypans and *dekshis* should be arranged conveniently nearby.

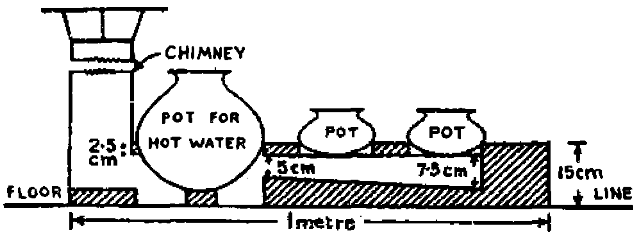
After the meal the dishes have to be washed in the sink, after being scraped clean. The place for storing the dishes and utensils after washing should be conveniently near the sink and the place of eating. When the kitchen is a small dark room, it is both inconvenient and difficult to keep it clean. Therefore, the kitchen must be a room full of light, with good ventilation, because it is the place in which the family's food will be prepared. Windows will be necessary especially when there is no chimney to carry away the smoke and fumes.

HEAT FOR COOKING

Cooking may be done on either an open fire or a closed stove. In India, the fuel burnt in open fires is usually wood or flat cakes made of cow-dung and straw. Of these two, firewood makes the better and hotter fire, is cleaner and gives out no smell. In recent years, kerosene, electricity, charcoal, Leco and methane gas are being increasingly used as fuel. Cow-dung should never be used as fuel, since it is required for manuring purposes because of its high nitrogen content.

The Smokeless Chula. Dr. Raju of the Engineering Research Laboratories, Hyderabad, has evolved a low cost *chula* in which the consumption of firewood or coal is minimum. In the *Raju Chula* (Figure 11), the hearth is raised about 60 cm. from the ground and the *chula* is built on top of this platform. The arrangement is L-shaped. The fire is lighted at one end and the smoke and heat is drawn through the chimney at the other end. The *chula* provides for three holes, each 20-30 cm. in diameter, on which cooking pots are placed. Even those not in use must be covered, so that all the smoke is carried through the chimney and none escapes into the room. There are





From Dr. P. S. Raju's *Smokeless Kitchens for the Millions* (Christian Literature Society for India)
FIG. 11. Two types of smokeless *chulas*

several other smokeless *chulas* of an improved variety such as the *Kallupatti Chula* and the *Bakshi ka Talab Chula.* Whatever be the type, it is necessary that the housewife should change her old-fashioned methods of cooking by learning to use these devices to her maximum advantage. The result will then be a clean kitchen, and as there will be no wastage of heat, the running costs will also be minimum. There are different designs of 'smokeless *chulas*' in the market ranging in cost to suit the means and needs of different classes of people.

The charcoal *sigri*, oil and gas stoves are good for those who can afford them. The majority of our population cannot afford them. Therefore for smokeless kitchens, the inexpensive and efficient smokeless *chulas* can be used.

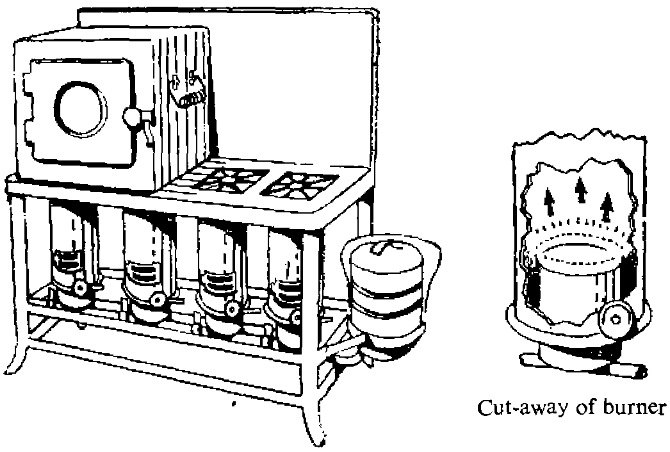
Charcoal. The charcoal *sigri* has the advantage of producing no smoke. On the other hand, the fumes of unconsumed carbon monoxide are dangerous unless the room is well ventilated.

Stoves. The scarcity of fuel and the ignorance of many housewives is responsible for the fact that stoves with ovens are uncommon. Ovens can reduce the need for frying food. A metal pan with deep sides and a close-fitting cover may be used for baking. Hot ash can be used to line the bottom of the pan, on which another tin containing the ingredients is placed. Hot ashes can also be placed on top of the cover.

In the market several oil stoves are available for cooking.

Kerosene Stoves. Those using kerosene need to take the same care as kerosene lamps require. The kerosene stove does not burn the liquid kerosene right away but only burns the vapour of kerosene which is produced by heat. The result is a blue flame.

The blue-flame cooking stoves (Figure 12), which burn ordinary kerosene fed by a wick, are excellent. They give out intense heat, but special care is needed to keep them clean and in good order. The odour of kerosene oil will otherwise make the food unpalatable.



Cut-away of burner

FIG. 12. Blue-flame kerosene stove

Spirit Stoves. Methylated spirit is useful in small stoves for emergency purposes, but it is very costly for everyday use. It is a patent, solid compressed, combustible material which is sold and used particularly for travelling or emergencies. It is useful and effective but expensivė.

Gas Stoves. Cooking stoves burning coal gas are extremely efficient, easily regulated and clean. If care is taken not to waste gas, they are not expensive. However, the usual precautions are needed when gas is used. Butane gas (methane) is now commercially available in the major cities and towns of India, along with suitable stoves (Figure 13). The stove, when lighted, is connected to the supply of gas. When the gas in the cylinder has been exhausted, a new cylinder can be obtained from the agents. In using gas care should be taken to avoid the exposure of gas to food or to the air around, since it is highly inflammable.

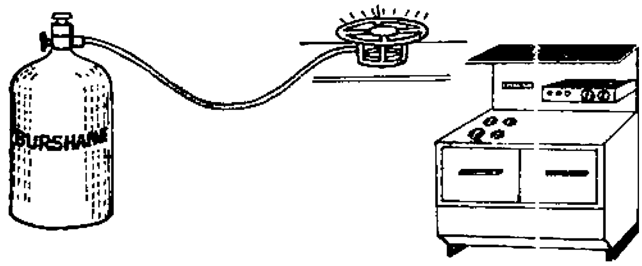


FIG. 13. Gas cylinder and stove

Leco. The characteristics of lignite which is commercially known as 'Leco' are that it catches fire quickly and gives a sustained heat. It is smokeless, odourless and economical and can be used in ordinary charcoal ovens. The heat efficiency is higher when used in the ovens specially constructed for the purpose.

Cow-dung Gas. Cow-dung gas is obtained by fermenting cow-dung in specially constructed plants (Figure 14). Inexpensive cow-dung gas plants can be set up in villages with the assistance of the Khadi and Village Industries Commission.

The cow-dung slurry derived from the cow-dung gas plant has been the subject of recent research for village improvement. Apart from supplying an effective fuel within a short period, the gas plant produces an efficient manure in the form of slurry.

Research has been carried out at Sri Avinashlingam Home Science College to compare relative costs and the economical uses of different fuels. A comparison of cow-dung gas with ordinary firewood, butane and kerosene

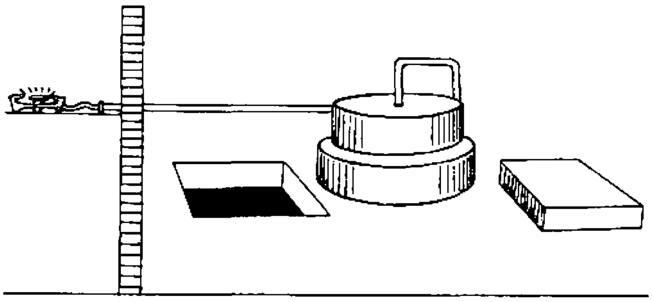


FIG. 14. Cow-dung plant

revealed that cow-dung gas and butane are advantageous by lessening the task of cleaning. Cow-dung gas was found to be the least expensive when compared to butane and kerosene, costing Rs. 9.00 per month for an average family of five members consuming three meals a day, and butane the most expensive, costing Rs. 23.40. The cost of kerosene averaged between the two, being Rs. 14.40 per month.

Electric Stoves. Electric stoves are heated by coils through which electric current passes. Electricity is superior to other forms of heat for cooking in terms of convenience, safety and efficiency, but the cost of electric current is

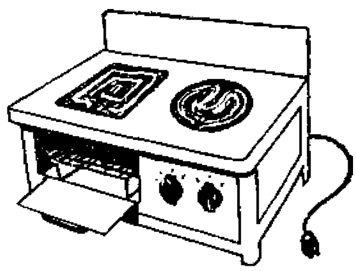


FIG. 15. 'Junior' electric cooker

higher than that of other fuels. However, appliances such as electric heaters, hot plates, kettles and toasters are coming into common use. A small electric oven as shown in Figure 15 with a griller and point is an excellent investment for those who can afford it. It is attractive clean and easy to work with. Where electricity is plentifully available, it is not expensive to operate.

OTHER EQUIPMENT

A table or built-in working centre which is about 70 cm. high is essential in the kitchen. For persons who are more than 150 cm. in height, the working height must be correspondingly raised to avoid stooping. Low tables can be raised on blocks of wood or bricks.

Water should be brought into the kitchen through pipes which have proper sanitary drainage systems. The sink or wash tub should be at the same height as the table, with drains sloping towards it. If one sits on the floor, or works at a table which is too low, one damages one's health, by constant bending. The parts of the body meant for bending are the hips and knees and not the back.

UTENSILS

Several sizes of *dekshis*, *chatties* or saucepans, one fitting into the other ranging in diameter from 20 cm. to 30 cm. and 20 to 30 cm. in depth, are convenient for all purposes. These should usually have close-fitting covers. For centuries, aluminium, copper and brass had been used for making utensils, but they required constant care. Now aluminium saucepans are lighter, more serviceable and easily cleaned than those made of other metals. They do not need tinning, as do copper and brass. However, aluminium reacts to salt and spices. Stainless steel, which is gaining popularity, is the best cooking utensil one can use although it is very expensive.

One or two frypans made of iron, like the *thawa*, are required. The *thawa* has a curved bottom, while the bottom of a frypan is flat or semi-circular like a *kadai*. The thicker the metal, the better it is for roasting to be even, for it prevents food from being burnt or charred.

Two or three large earthenware jars are needed for storing clean water for drinking. The earthenware jars help to keep water cool. It is more convenient to have about three jars, so that one can always be washed and sunned while the others are in use. Large dippers, made of coconut shell, plastic or metal, can be used for taking water from the jars.

A smooth board, of about 25 cm. in diameter, for rolling bread and pastry, and a rolling pin are needed for making *chapathis*, *puris* and similar preparations. Another small board is required for mincing herbs and cutting vegetables. A meat block, cut from a cross-grain of hard wood, and a large knife are necessary for cutting meat.

Different types of scrapers for coconuts, and vegetables like carrots are essential. A circular piece of metal, edged with teeth and fixed to a piece of wood, is the kind generally used.

Weights and scales are necessary in the kitchen for measuring ingredients while using recipes. Measuring cups and spoons help to save time. *Katoris* (cups) and plates should be available for holding liquids and spices while cooking. Ladles of varying sizes with insulated handles, perforated ladles, kitchen knives, brushes, strainers, sifters and winnowers are all needed depending on the choice of the housewife. These are the chief tools required to save time and labour, but many more can be added according to one's need and one's means.

Keep the tools close to the place where they are needed. The articles used for washing should be hung above, or put in a drawer or at the place of preparation. Frypans and *thawas* should be kept near the stove. In this way, one can immediately find the right utensil when required.

WASHING UP

The utensils in which food is prepared, cooked and served require the utmost cleanliness and care to prevent infection. They need to be washed carefully. The following are the steps in washing:

1. Sort the utensils according to the material of which they are made—stainless steel, silver, glass, aluminium or china;
2. Place them on the left-hand side of the sink or washing place.
3. Scrape off all the matter sticking to the eating and cooking utensils. Use a bundle of coconut fibre, a brush, or a piece of a leaf or paper for the purpose.
4. Prepare two basins, *dekshis. chatties* or sinks of hot water. Empty a little detergent or a soda solution in one and keep it close to the soiled dishes on the left-hand side. The other with clear water will be used for rinsing the dishes after they are washed.
5. Wash the items in order, taking glass first, china next, silver, stainless steel, brass and other metals last. As soon as an article is washed, dip it in the clear water to rinse off the soap, and set it to drain on the

right-hand side of the sink or table, or preferably on a rack (Figure 16).

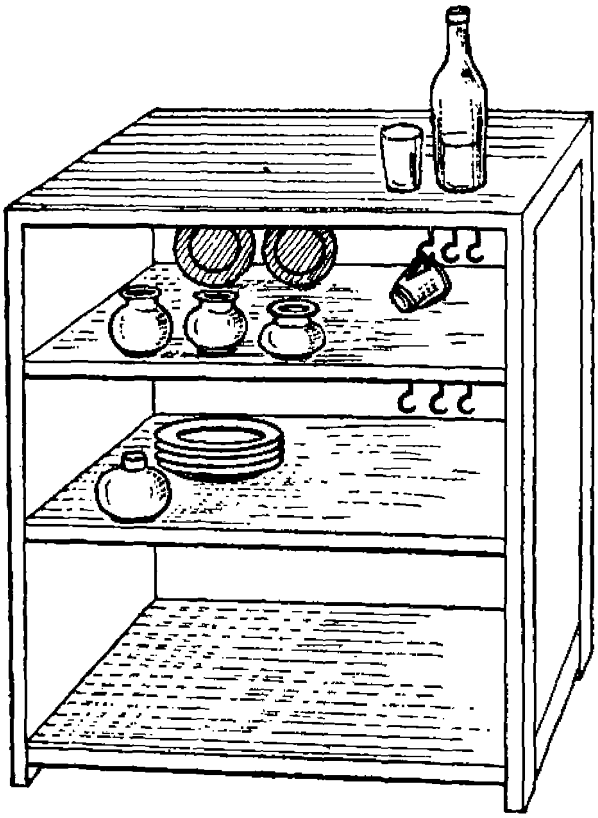


FIG. 16. Rack

6. Put the rack to drain in a clean place, or dry the washed utensils with a clean cloth. Metal must be

perfectly dry. Otherwise, the water drops will leave stains and the metal will tarnish or rust.

The cloths used to wash or dry should be washed at once, rinsed, cleaned and hung to dry in the sun.

CLEANING THE KITCHEN

Sunshine is the most important agent in maintaining cleanliness in the household. Our country is blessed with an abundance of sunshine, but because of the heat, people are inclined to exclude this beneficent gift from their homes. At least the morning light should be allowed to reach every part of the house because sunlight destroys bacteria, yeast and moulds and prevents rust and mildew.

The second in importance is clean fresh air. To flood the rooms at least twice daily with a strong draught of air is healthy. The kitchen should be well ventilated to keep away the fumes of fuel and flavour of food.

For efficient work, the housewife must be able to see what she is doing. Therefore she must arrange the equipment in which food is prepared in those places where light falls. If the kitchen is not well ventilated, she will feel fatigued more quickly.

Water is a great solvent. All cooking utensils are cleaned with water. Housewives are fortunate if their kitchens have facilities for running water. Whether this is so or not, water must be stored for use. With a sink fixed, as shown in Figure 17, waste water can be carried away through the drain. The drain must be kept very clean. If any greasy water is poured into the drain, it should be followed by pouring boiling water to prevent grease from accumulating on the sides. The sink should also be carefully scrubbed and if any part of the sink is made of iron, it should be wiped dry to prevent rusting. If it does turn rusty, sprinkle kerosene oil with *chunam* or lime, and leave overnight.

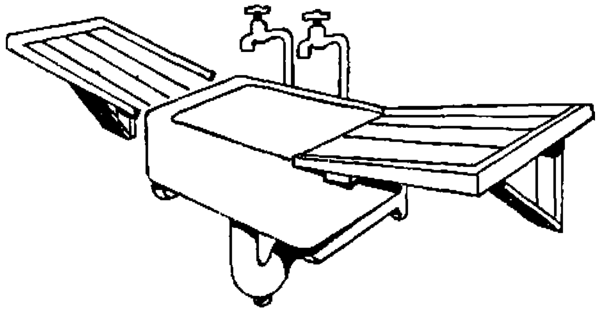


FIG. 17. Sink

Polish brass taps with rotten stone and oil, and rub with a dry cloth. If they are greasy, wash with water and washing soda. Nickel taps should be only washed and wiped.

GARBAGE BINS

Solid waste materials from the kitchen should be collected in tins or other containers which have handles and close-fitting covers. It is wise to have two cans if possible, so that both can be washed and sunned on alternate days. After emptying the garbage, rinse the garbage containers with washing soda dissolved in boiling water and dry them in the sunshine. In order to make cleaning easier, you can line the garbage container with a polythene sheet or old newspapers. When garbage is carried to the place where it is collected or dumped, you can show good civic sense by emptying it carefully into the box or pit and not letting any garbage fall upon the ground. Exposed waste matter is the breeding ground of flies and cockroaches, and you must remember that flies carry disease. Therefore always keep the garbage bin well covered.

STORING FOOD

The store room should be in a convenient place from which food can be easily taken when needed. It should have a window to provide air and light. It would be convenient if floors and shelves, in the store room, as in the kitchen, were made of stone, concrete or were tiled, all three of which are expensive, but which make cleaning simple. Shelves should be placed at convenient heights. They should be neither too wide nor too narrow for the containers in which materials are to be stored. Do not waste space by having the shelves too far apart. If you are making shelves, it is better to decide what is to go on each shelf, and then construct the shelves, so as to fit the jars, tins and other articles.

Since it is more economical to buy dry food in large (bulk) quantities, storing them where they will keep dry and where vermin cannot attack them is most important. It is not wise to store cereal grain in a dark damp room. Rats are easily attracted to such places and there will always be the risk of plague. Large, circular metal bins are best for storing grain. If earthen jars are used, they must be free from cracks and should be provided with well-fitting covers. It is a good practice to place jars on wooden racks, so that air can circulate underneath and keep them dry.

Boxes used for storing pulses and other similar food should be tin-lined. A number of boxes, made to the right size, would make good and sanitary containers.

Always label the containers. Paint or ink can be for this purpose and gives a general appearance of neatı and finish.

STORING FRUIT AND VEGETABLES

All perishables should be kept as cool as possible. The best way to store fruit and vegetables is to use a refrigerator if one can afford it. For those families who cannot, a wire-meshed shelf through which air can freely circulate, but which keeps out insects and rats, is the safest and best substitute. Alternatively, the exposed side of the store room, away from the rays of the sun, would be a good place.

A special section which is cool, clean and draughty should be assigned for keeping milk.

VENTILATION IN THE KITCHEN

Carbon dioxide is produced when wood is burnt. Therefore a great deal of carbon dioxide accumulates in the kitchen if it is not adequately ventilated and thus can be harmful to both animals and man. A still more poisonous gas, called carbon monoxide, is given off when coal or charcoal is burnt incompletely. The results of living in an atmosphere made foul and stuffy by carbon dioxide and other gases are fatigue of body and mind, drowsiness, yawning, headache, nausea, faintness, lack of vitality, poor appetite and digestion, poor blood circulation, skin troubles, post-complexion and susceptibility to infectious diseases, especially those affecting the respiratory tract. Even if the kitchen has an inadequate number of windows it must have a chimney which can act as a ventilator. When the wind blows across the top of the chimney, it sucks up the stale, warm air from within, and thus purifies the remaining air in the room.

Assignments

1. Observe the kitchen arrangements in your house. How far are they satisfactory for the smooth flow of work?
2. Describe the fireplaces and *chulas* used for cooking in your neighbourhood.
3. Make a list of the minimum utensils according to their uses needed in the kitchen.
4. Make a wired vegetable shelf for the family.
5. Collect pictures of, or draw the labour saving devices which will be useful in the kitchen.
6. Experiment with the smokeless *chula* and evaluate its advantages and disadvantages.
7. Write an essay on the type of kitchen you would like to have, giving reasons.

CHAPTER IX

THE WATER SUPPLY FOR THE HOUSEHOLD

WATER is an indispensable need for living beings. Three-fourths of the surface of the globe is covered with water. From this water moisture is constantly rising in the form of vapour and descending in the form of rain, hail or snow.

What is water? Water is a liquid substance made up of two gases, oxygen and hydrogen. Two parts of hydrogen are united with one part of oxygen to form water. These gases are not just mixed as in air in which oxygen and nitrogen are parts of a mixture. They are united together chemically to form the new substance, water,.which is of a different nature. Thus water is an example of a *chemical compound.*

IMPORTANCE OF WATER

Water is very important for human existence. It is an essential requirement for human nutrition. It is required also for sanitary purposes such as washing clothes, cleaning utensils and the house. Water constitutes nearly three-fourths of the weight of our bodies because every tissue and organ in our body contains water. Water is required for digestion and absorption. It is the carrier of nutrients and other body substances to the circulatory system. It helps to regulate body temperature, and removes waste matter from our systems. It is the chief component of all fluids and tissues.

Clean water is necessary for drinking, cooking, cleaning, bathing and other household purposes. For bathing and washing clothes, water must not only be clean but also soft. For drinking it must be potable.

Some dreadful infectious diseases are caused by minute living creatures called *micro-organisms*, *bacteria* and *viruses*. They are more commonly known as *germs*. However, all germs are not harmful. Some of the disease-producing germs live in impure air, in impure solid food and in impure water. The germs of cholera, enteric fever, dysentery and diarrhoea are found in unclean water and food and some types of worms also enter and live in the human body through these agents.

Therefore we need to be extremely careful about our sources of water and food. Where does your water come from? How is it brought to your home? Water may be obtained:

Direct from rain water from the clouds and collected in a pool or in a cistern;

From a spring, well, tank or river. It may be brought to the house by means of a pipe, a water cart, or a waterman or waterwoman who carries it in goatskins or brass and copper pots.

Water which comes direct from clouds is in its purest form. It becomes impure by:

1. Passing through the air in cities, picking up germs, soot, dust and other impurities.
2. Running on the surface of the land on which it falls.
3. Sinking into the ground and passing near human and animal habitations which are polluted by body wastes.
4. Pollution by people bathing and spitting or washing their clothes in tanks and pools. Sometimes people with skin diseases and other contagious diseases bathe in tanks and rivers.

5. Coming in contact with sewage water when it is drained into the river.
6. Mixing with the remains of fish and crocodiles in tanks and rivers. On the other hand, fish and many water plants devour decaying organic matter and help to purify water.
7. Birds and monkeys contaminating water in uncovered wells.
8. Those who bring water to our homes in unclean or infected containers.
9. Dissolving and carrying away certain harmful chemicals in its passage through the ground.

Impurities in water may be held in solution or suspension.

EXPERIMENT. 1. *To illustrate the difference between solution and suspension.*

Take two glasses of clear water. Add to one a small quantity of sugar, to the other powdered chalk. Examine after some time. Which of the two has dissolved? Discuss what you see.

When certain chemical salts such as those of lime and magnesia are present in water, the water is said to be *hard*. This hardness is apparent when soap does not lather (a soft foaminess) fast enough. Hence it is difficult, in hard water, to wash clothes or to boil *dhal* or vegetables, or make tea which tastes good.

DIFFERENT SOURCES OF WATER

Rain Water. Rain water is *soft*. Therefore, if the usual water supply is hard, it is advisable to store rain water and use it.

Rain water, which has been collected in shallow pools on the surface of the ground in highland districts, may be safe if situated far away from the habitations of men and the haunts of animals. But in the plains, it is always contaminated by surface drainage. Even in the mountains, it should be protected and purified. If such pools are the only source of water in the plains, one pool should be fenced and reserved for drinking, and water from the others should be collected only by special watermen.

Springs. Springs, formed by water gushing up from the ground owing to internal pressure, may be either surface or main springs. The water from main springs gushes up from a hole in a deep stratum of rock (Figure 18) and may be generally safe. Surface springs are liable to surface

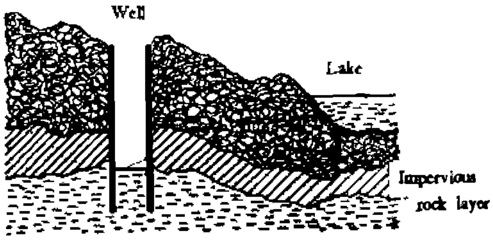


FIG. 18. Deep and surface water

pollution. Surface pollution of the ground means rendering the ground impure by the body wastes of human beings or animals.

Wells. Water is present beneath any area of the earth's surface, though sometimes one has to dig deep to tap it. Such sources of water or the deep holes we dig are known as wells. Being artificially made for human use, they are naturally dug near dwellings. Therefore, unless they are protected there is danger of surface pollution.

It is commonly known that the germs of many diseases pass out of our systems along with ordinary body wastes.

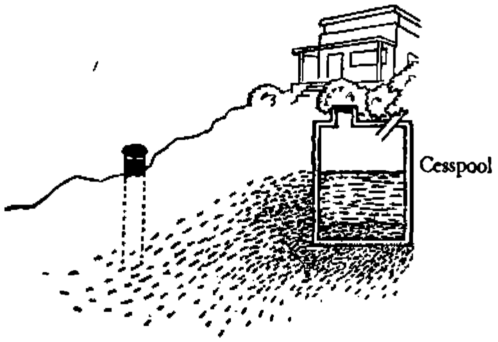


FIG. 19. Bad site for well

When these are deposited on the ground, some of the germs sink below the surface and are carried by the next rainfall into the nearest well or river or tank occurring at a lower level (Figure 19), thus rendering the water contained unsafe for drinking, bathing and other domestic purposes. Therefore wells should be dug in areas of a higher elevation than the houses to which they supply water (Figure 20).

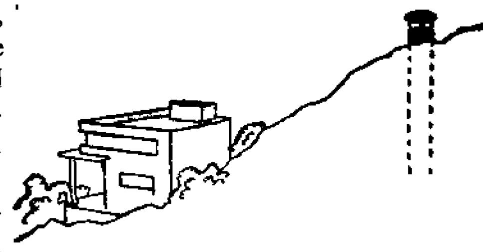


FIG. 20. Good site for well

Wells are usually divided into three classes: (a) Shallow wells, (b) Deep wells and (c) Artesian or Tube wells.

Shallow Wells. These are wells in which water is reached before a layer of rock is encountered. Because of surface drainage near the house. this class may be considered dangerous.

Deep Wells. These are wells in which water is found below a layer of solid rock. The latter sometimes has to be hewed or blasted for the water to be tapped. The water below may be considered generally safe, but the lining of the well to a depth below the level where the ¡mpervious stratum is penetrated, or else to a depth of eight metres, should be of cement or some other non-porous material. The surface of the grouud should slope away from the mouth of the well. All wells should be protected by a roof or a cover as shown in Figure 21.

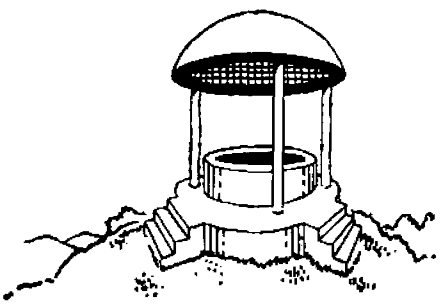


FIG. 21. Covered well

Artesian or Tube Wells. Artesian wells were first sunk at

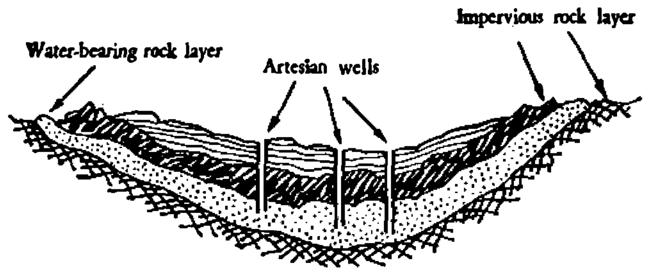


FIG. 22. Artesian wells

Artois in France. Due to the vast amount of subterranean water, these wells receive a perpetual supply from the water which rises by its own force to the level of the opening of the iron tubes hammered deep into the ground by means of machinery (Figure 22).

These tubes within the ground send water through it to the surface. As in deep wells, water from Artesian wells is pure. The opening being small can be protected easily. This source is considered to be the most safe. Water from main springs and deep wells is usually pleasant to taste.

Water from Tanks. Water from tanks may be contaminated from surface pools and animals. If used as the source of supply for a town or village, it must be protected and carefully purified before being distributed for domestic consumption.

Rivers. River water may be polluted in the same way as pool and tank water, with the additional risk of contamination from city drains. However, oxygen in the air under the influence of sunlight has a remarkable effect on river water especially if the river is rapid and has many eddies and falls. Water plants, too, release a constant supply of oxygen, which helps purification. Nevertheless, river water, even at a distance from human habitation, must be purified for drinking purposes.

Distilled Water. Distilled water is obtained by heating water and trapping the steam in cooled tubes (Figure 23). The vapour passes through the metal tubes immersed in a container through which cold water is allowed to run continuously. The vapour in the tube condenses and passes out as distilled water. Distilled water is as pure as rain water. It is frequently prepared from sea or brackish water, in areas where no other water is available. The town of Aden is largely supplied with water in this way.

Having seen where water comes from, and the many

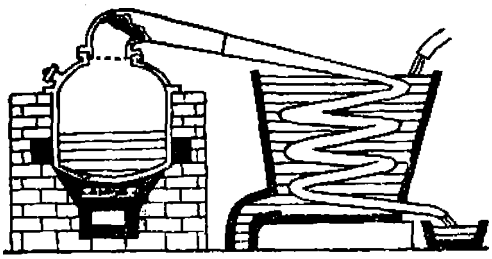


FIG. 23. Distillation of water

ways in which it may get polluted, we must now be able to detect impurities in water and know how to purify and make it fit to drink.

HOW WATER CAN BE TESTED

Some impurities in water can be detected by the senses—sight, taste and smell. If water is turbid, that is, if it is not clear, or is tinged with colour, or if it tastes or smells unpleasant, it is not pure and is probably harmful. The smell, if any, can be best detected if the water is heated in a narrow-necked flask and smelt at a temperature of 26.6°C. However, the most dangerous impurities are imperceptible to the senses. To detect them, the chemist and the biologist must be approached. However, one or two simple experiments can be performed by anyone. They are:

EXPERIMENT 2. *To test water for organic impurities.*

Put permanganate of potash in a pail of water. If it turns brown instead of pink, organic impurities probably exist.

EXPERIMENT 3. *To test water for hardness.*

Rub soap into the water. If a lather is not formed, salts of lime, magnesia or other mineral matter are present.

EXPERIMENT 4. *To test water for sedimentary impurities.*

Boil water in a glass flask till all the water has evaporated. If the water is perfectly clean, no sediment will remain.

EXPERIMENT 5. *To examine water through a microscope.*

Put a drop or two of water on a glass slide and examine through a microscope. Note what you see.

HOW WATER CAN BE PURIFIED

Water brought through main pipes from large tanks or rivers is usually passed first into large reservoirs, in which it is left for a few days, or even weeks, until all dirt and decaying matter sink to the bottom. The water then is generally clean (free from dirt), but not pure (free from germs). This clean water is then passed slowly through filtering beds made up of a layer of coarse gravel and another

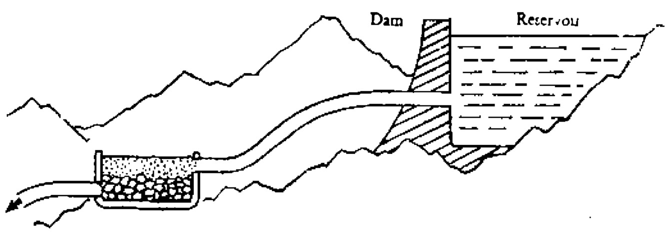


FIG. 24. Filter bed

of sand, each about a metre in depth (Figure 24). Sand has the property of holding back disease germs. The beds must be cleaned periodically, at least once every month.

After filtration the water should be tested and if still found impure, it should be treated with chemicals which will destroy germs. The storage, purification and distribution of water is one of the most important functions of a municipality, whose duty is to inform the public of the condition of the water at any given time. The Public Analyst appointed by the Government will analyse and report on any specimen of water sent to him, so that there will not be any doubt about the purity of water.

Impure water from the well may be purified by putting permanganate of potash in a bucket of water and adding this water to the well. The amount of potassium permanganate added will depend on the depth of the well.

Unless water is brought into the house in clean pipes and certified by the municipality, or carried in covered vessels by known healthy persons direct from a certified deep well or main spring, it is essential to boil water to be sure that it is safe to drink. If it is not clean, it should be purified with alum before being filtered.

EXPERIMENT 6. *To clean water with alum.*

Put 170.4 g. of alum into 5 litres of water. Do not exceed the quantity of alum since the taste will then be very unpleasant. The alum combines with the suspended and colloidal impurities and dirt and causes them to sink to the bottom. However, such water is still not pure. Only after boiling it becomes pure for drinking.

After being boiled, water should be carefully stored, preferably in porous earthenware vessels. When water evaporates, heat is given off. As water passes throughout the porous surface of the vessel continually, evaporation takes place, and cooling results. However, these vessels must be periodically cleaned with permanganate of potash, and must be exchanged for new ones as soon as they cease to be porous.

Household Filters. Some people use filters, that is, containers through which water is strained and purified. Such filters clean the water, but cannot be relied upon to get rid of the bacteria. The candle filter, in which the water passes through a fine porous porcelain candle-shaped cleaner, is among the best. But it is very essential to renew the candle from time to time, as the pores get filled up with solid particles which form a good breeding ground for germs. A tap filter, if frequently cleaned, is useful when pure water is needed for use in institutions like hospitals and hotels, but the water for drinking should be always boiled as well as filtered. If you buy a filter, be sure you understand the principle on which it works.

Simple boiling destroys most disease germs. Thirty minutes are needed to destroy the germs of tetanus or lockjaw.

If the supply of water comes by pipes from a tank or spring situated on a higher level than that of the house, the water will, of its own accord, always fill the pipes at the top of the house. If the elevation is only slightly higher, when the water falls low (as it does before the monsoon), it will not rise to the higher pipes, and we must carry water upstairs, unless pressure is applied to the water supply.

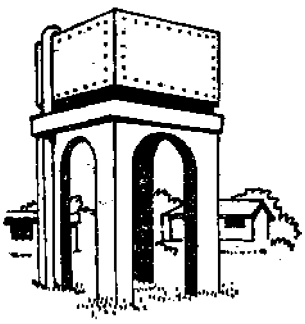


FIG. 25. Water cistern

If the source of supply is lower than the house, as from a river or a well, then the water must be taken into a cistern above the level needed for all purposes. Sometimes a very large cistern, as in Figure 25, placed as a water tank on a tower or strong pillars can serve several families. You may often see such water tanks in railway colonies where there are several bungalows, houses, offices and workshops.

How does your school and your house get water? If it does not rise naturally, force is required, and this is usually supplied by a pump. Water from a cistern, or direct from the natural source, if placed at the right elevation, is distributed over the house in pipes, and is let out when wanted by means of a tap, which is simply a little brass door opened and shut by a handle. Examine a tap as represented in Figure 26. The housewife should always see that the taps are properly turned off and do not drip. She should also know the point at which the house pipe enters the house from the main pipe (Figure 27) called the main, and the means of turning off the water. The water should be turned off at this main if a leak has to be repaired and also if the house is left shut while the owner is away.

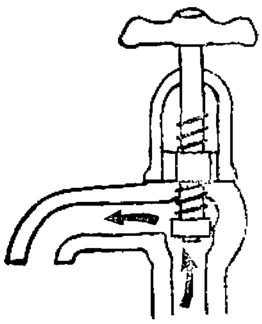


FIG. 26. Water tap

In some municipalities, water-meters are placed near the mains, before the water enters the houses. The word *meter* means measure, and a small mechanism situated at that point where the water pushes its way

1970

An *acid* is the opposite of an *alkali*. As already seen it turns blue litmus paper red. It has a very sharp sour taste, while an alkali tastes bitter. An acid combines with an alkali to form a *salt* which is crystalline in form and has its own special 'salty' taste. Many salts however are poisonous.

Beeswax is a hard yellow wax produced by bees. *Oil* is an inflammable liquid, which has certain properties which do not allow it to combine with water. It is lighter than water. *Stone* is a natural material found in the crust of the earth. *Powder* is finely ground stone

Spirit is a fine liquid which will combine with water. It is highly inflammable and turns easily into vapour.

Having examined the cleaning equipment and materials, the next step is to clearly understand the procedures in using them to clean the house.

CLEANING FLOORS

Cleaning Stone Floors. Ordinary stone floors must be swept daily and washed frequently with strong soapsuds and soda mixed in a pail, and applied with a cloth mop. If the floor needs more cleaning, use a scrubbing brush, preferably a long-handled one, to prevent stooping. Scrub, then pour clean water and dry with a drying mop. Stone walls and brick floors or walls can be washed in the same way.

Paint stains may be removed by rubbing with turpentine. If the paint is old, turpentine mixed with a powder, ash or stone will help in its removal.

Marble staircases, bathrooms and tops of washstands should be washed with soap and water and wiped thoroughly dry. They can be polished with a smooth piece of marble and water and then dried. To remove rust and stains on marble, rub the areas with soap and water. If the stains do not disappear, you can apply an acid, such as lime juice, tamarind, or oxalic or hydrochloric acid, taking two parts of water to one of acid. Wash off at once with soapy water. Since soap contains alkali, it will neutralize any acid that may be left. Then dry and polish. Marble is composed of lime which is alkaline. Since alkalis and acids combine together to form salts, the acid combines with the surface of the marble thus removing a fraction of it and the stain along with it. Since very little is removed with a quick rub, one cannot really see any difference on the surface. But on the other hand if acid is left on marble for long, the smooth polished surface would be spoilt.

Tiled Floors. Tiled floors must be swept and washed every day. Red floor tiles are very difficult to keep clean. Every foot mark shows on them. Dust that would be invisible on other floors appears as a thin film on red tiles. This film cannot be removed by ordinary brooms. A cloth tied over the head of a hard broom, and pressed down while sweeping will be effective. If the room is used often the floor should be wiped two or three times a day. Tiled floors may be polished with a small amount of the mixture used for cleaning wooden furniture. When dirty, they may be washed with strong soapsuds and soda.

WALLS

Tiled Walls. Wall tiles can easily be kept clean by washing or wiping with warm, soapy water. They are so highly glazed that unless they crack, stains cannot penetrate through them.

Painted Walls. Painted walls can be washed with soapy water, taking small sections at a time, and cleaning with straight vertical strokes. You must then wipe them quickly with a clean cloth. If the paint is white, or of a pastel shade, moisten a cloth in hot water and shake a little whiting instead of soap over it and proceed in the same way. Soda is liable to change the colour of paint.

Distempered Walls. Distempered and whitewashed walls can be washed occasionally with cold water in which, if they are dirty, a little soda and lime has been dissolved. However, the distemper will come off in parts and leave uneven streaky colouring behind, unless a sufficient quantity of glue or adhesive had been mixed in the original wash.

Papered Walls. Papered walls cannot be washed unless they are glazed. They should be swept with a soft broom and cleaned with bread crumbs.

DAILY CLEANING OF WALLS AND CEILINGS

If the walls and ceilings are brushed daily with a soft, long-handled mop or broom covered with a bag made of soft cloth, they will be free from dust and insects. However, many people neglect the walls and ceilings of their rooms, with the result that a layer of dust and germs cling to them and insects multiply in the corners and crevices. Ultimately they will need stronger cleaning treatments. A dry cleaning may be given to papered or distempered walls by sprinkling the walls lightly with chalk, lime or fuller's earth leaving it for a day, and then lightly brushing off.

WOOD

Cleaning. Wood is an important adjunct to the house. It is beautiful in itself especially when it is well maintained. Wooden articles used in the household may be plain, stained, polished, oiled, waxed, varnished, lacquered or painted. Wood is generally left plain for those items such as the tops of kitchen tables and pastry boards where frequent scrubbing is needed.

In order to wash wood, sprinkle a tablespoonful of powder or clean sand over an area of 1 sq. ft. and scrub hard using cold water. Wipe as dry as possible *immediately*. Never let wood remain wet because wood absorbs water and swells quickly. Then, if it dries suddenly, it will shrink and crack.

If wood has become dark and stained, it may be bleached by applying a mixture of quicklime, cold water and a soda or potash solution. Leave the mixture on for two or three minutes and then wash off. For ink stains, a small quantity of oxalic acid should be applied with a brush and quickly washed off.

Painting. Beautiful wood should never be painted, as paint hides the natural beauty of its grain and colour. For other pieces of wood, prepared oil paints can be applied following the directions given on the container. If the paint is too thick, thin it with turpentine. Paint with firm, downward, even strokes.

Painted wood, if dirty, is treated in the same way as painted walls. Never scrub and never use soda. You must rub gently with linseed oil and petroleum. A dry polish afterwards will improve the surface.

Staining. A good, inexpensive stain may be made by mixing 28g. of the crystals of permanganate of potash with 1.1 litre of water. Allow the crystals to be thoroughly dissolved. Wash freely and evenly over the surface and let it dry. Afterwards, apply varnish, oil or wax as desired.

Many different ready-made stains already mixed with varnish can also be bought. You can follow the directions given on the bottles.

Varnishing. Varnish is prepared from glue which is a sticky substance made from the hoofs of animals or from various gums or resins. Apply a thin layer of varnish with a clean brush in long, straight strokes, lifting your brush from the surface as little as possible.

Oiling. Using a thick cloth or flannel, rub any oil —lemon oil, kerosene oil, boiled linseed oil or coconut oil—on the wood with a circular motion. Rub in very little oil at a time. Polish in straight lines.

Waxing. Prepare wax by melting 100 g. of beeswax over hot water. When the wax has melted remove from the fire, and stir in turpentine till the mixture is like thin cream. Bottle it. You must use only a little of the prepared wax by rubbing it vigorously into the wood.

Polishing. Wood must be polished with a mixture of turpentine and linseed oil of equal quantities. The secret of beautiful polished wood lies in the time and labour given to polishing.

Cleaning Varnished and Oiled Wood. Use linseed oil and petroleum and rub with a soft cloth.

Cleaning Lacquered Wood. Wash with a soft cloth which has been soaked in warm soapsuds and wrung almost dry. When dry, wipe over with a very thin oil.

When using oil as a cleaner, you must apply it in small quantities at a time and rub well (except for lacquered wood). Never leave any on the surface since free oil will collect dust rapidly.

Cleaning Waxed or Polished Wood. Re-wax and re-polish using a clean cloth.

with soap and water just like any other painted object.

Earthenware. Unglazed earthenware is generally used as *chatties* for cooling water. The outside should be kept free from dust by wiping with a damp cloth, and the inside should be washed daily and rinsed periodically with a solution of permanganate of potash.

China. Glazed earthenware, China and enamel are cleaned with hot water and soapsuds and for greasy dishes soda should be added to the water. Then polish with a dry cloth. While washing cups and jugs, take special care to see that no dirt remains round the handles.

Glass. If your glassware is dirty or greasy, hot soapy water is required for washing and hot water for rinsing. Glassware must be rubbed dry and polished with a soft cloth.

Textiles. Textiles used in the household, apart from personal clothing, consist of carpets, rugs, mats, wall-hangings, mattresses, pillow and cushion covers, cloth used on upholstered articles, table cloths, table napkins, blankets, sheets and coverlets for beds, towels, and cleaning cloths. The methods of washing these fabrics are given in the section on clothing. Whenever possible, heavy textiles such as carpets, mats and rugs should be taken out of doors at least once a week to be brushed, shaken and beaten. If it is not possible to take these things out of doors, clean them indoors with a carpet-sweeper or a vacuum cleaner, or, failing that, scatter over them damp, washed tea leaves from the teapot or bits of damp newspaper or damp sawdust, and brush with a brush into a dustpan. The dust adheres to the damp material and so does not rise into the air. Always remember to empty the dustpan into a covered receptacle.

Many different ready-made stains already mixed with varnish can also be bought. You can follow the directions given on the bottles.

Varnishing. Varnish is prepared from glue which is a sticky substance made from the hoofs of animals or from various gums or resins. Apply a thin layer of varnish with a clean brush in long, straight strokes, lifting your brush from the surface as little as possible.

Oiling. Using a thick cloth or flannel, rub any oil —lemon oil, kerosene oil, boiled linseed oil or coconut oil—on the wood with a circular motion. Rub in very little oil at a time. Polish in straight lines.

Waxing. Prepare wax by melting 100 g. of beeswax over hot water. When the wax has melted remove from the fire, and stir in turpentine till the mixture is like thin cream. Bottle it. You must use only a little of the prepared wax by rubbing it vigorously into the wood.

Polishing. Wood must be polished with a mixture of turpentine and linseed oil of equal quantities. The secret of beautiful polished wood lies in the time and labour given to polishing.

Cleaning Varnished and Oiled Wood. Use linseed oil and petroleum and rub with a soft cloth.

Cleaning Lacquered Wood. Wash with a soft cloth which has been soaked in warm soapsuds and wrung almost dry. When dry, wipe over with a very thin oil.

When using oil as a cleaner, you must apply it in small quantities at a time and rub well (except for lacquered wood). Never leave any on the surface since free oil will collect dust rapidly.

Cleaning Waxed or Polished Wood. Re-wax and re-polish using a clean cloth.

Cleaning Wooden Furniture. Dust well every day and with a soft cloth occasionally rub in very little of one of the following mixtures:

1. 450 g. beeswax, melted over hot water
   $\frac{1}{2}$ litre turpentine
   $\frac{1}{4}$ litre alcohol
2. 1 part turpentine
   1 part vinegar
   1 part linseed oil

These make useful creams, which keep well and help to preserve the polished surface. Shake well before use.

Removing Scratches and Dents. Rub with oil or method No. 1 polish as shown. If the wood tends to discolour apply a solution of permanganate of potash with a very fine brush. Polish when dry. For a deep dent, lay on moist blotting paper and press down with a moderately hot iron till the wood swells to its former level. Polish as shown before.

Filling up Cracks. Sometimes wood cracks owing to great heat and dryness and sometimes a *knot* comes out. If the crack is large, the carpenter should be consulted. If it is small, you can fill it in the following way : take

1 part boiled linseed and $1\frac{1}{2}$ parts turpentine.

1 part of whiting or cornflour.

If the wood is dark, use artists' colouring till the right shade is obtained.

Fill the crack ; smoothen the surface ~~; let~~ it dry and then polish.

Treating Water Rings. Water rings, caused by putting wet glasses or spilling water on polished wood, can be removed by rubbing with a little methylated spirit or a solution of ammonia.

HOW TO CLEAN METALS

Aluminium. Wash aluminium with hot soapy water and wipe it dry. If this is not enough, rub with lime juice or similar natural acids. Rinse in hot water and dry thoroughly. Do not use salt or an alkali such as soda, as they darken and destroy aluminium.

Bell Metal, Copper and Brass. Copper and brass tarnish in the presence of carbon dioxide and form verdigris, which is a poisonous carbonate. If metal is badly tarnished, wash it with a soda solution. Clean with lime juice or vinegar and a fine powder. Wood ash from the kitchen fire is used often. Wash with water, dry and polish with soft powder and a soft cloth.

Britannia Metal. Clean Britannia metal with very fine powder and oil. Wash with hot soapsuds. Then dry and polish with a soft cloth.

German Silver and Nickel. German silver should be washed with soap and water. Polish with fine powder moistened with alcohol, ammonia or water. Wipe it dry with a soft cloth. Do not use acids on German silver or nickel.

Cast Iron. Iron molten and cast into moulds is called cast iron. Boil cast iron utensils in a strong solution of soda and water to remove grease. Rub with powder and wash with hot water. Dry while still hot. If the iron is rusty, clean it with pumice stone, or with emery powder and oil.

Galvanized Iron. Galvanized iron is used for sinks and pails. Wash galvanized iron as you would wash cast iron. Rub a few drops of oil over the surface to prevent rust where the galvanized coating has worn off. Rust is a reddish, powdery substance which forms on iron when iron is allowed to remain damp. It is caused by the surface of the iron combining with oxygen in the air and forming a new substance called *iron oxide*. Oxygen also combines easily with other substances and forms oxides.

The main parts of a cooking stove consist of iron and steel. After cooking, wipe off the grease or remains of food on the stove with a newspaper. Wash with hot soap-suds and wipe again with clean newspaper. Occasionally rub the stove with a cloth just moistened with kerosene. A special blacking can be applied with a brush for cleaning stoves, but it is more troublesome to keep stoves clean by this method. Cleaning with newspaper instead of cloth saves much trouble in washing cloth dirtied by soot and grease.

A small hard-bristled brush is best for cleaning out the corners of iron cooking utensils. Small mops are also useful.

Silver and Silver Plated Articles. For the daily washing of table utensils, keep silver and silver plated articles separate from other articles. Wash them in fresh hot soapy water, rinse in hot water and wipe at once with a dry cloth. Always treat silver gently, as it easily scratches and dents.

Ornamental silver should be rubbed with a soft cloth when it is dusted daily. A special cleaning should be given to all silver about once a fortnight. Use whiting and water, or whiting and alcohol (methylated spirit will do). Use only enough to moisten the whiting, and rub with a soft cloth, velvet or leather. If the silver is elaborately ornamented, use a soft brush. After cleaning, wash it in hot soapy water with a drop of ammonia and dry with a towel.

Do not use acids on silver. Silver tarnishes in the presence of sulphur and forms silver sulphide.

Steel. Treat steel as you would treat iron if it is greasy, but do not use pumice stone on steel. Rub with powder. Bathbrick is generally used on a knife board (a long strip of board with a leather surface). Wash in hot soapsuds and wipe dry.

Stainless Steel. Wash in soapy water and rub dry.

For the handles of knives, dip quickly into hot water and dry. Avoid wetting them, as wetness loosens the handles.

Tin. If tin is greasy, soak for ten minutes only in hot water with a little soda, for soda tends to dissolve tin. Rub with a fine powder. Wash in hot soapsuds, then rinse in hot water. Wipe it dry while hot.

Zinc. Rub zinc with whiting mixed in water or kerosene. Many metal polishes may be bought from shops. Some are very good, but all are expensive compared with those that can be made at home with simple ingredients. Whether you prepare your own cleaners or buy them ready-made, do not make the mistake of thinking that one polish will do for all metals, for metals differ much in their nature and properties.

For a rough metal use sand; for a medium one, bathbrick or wood ashes from the fire and for a fine one, whiting. The best effect is generally obtained when the powder is mixed with a little oil. When a rough powder is needed, many people use simple earth. Never use earth unless you are sure that there are no impurities in it.

HOW TO CLEAN OTHER HOUSEHOLD ARTICLES

Basketwork and Canework. Brush well daily with a long-bristled brush. When the natural polish of the cane or wicker work wears off, the object may be varnished or painted with two coats of thin oil paint. It can then be washed occasionally with soap and water just like any other painted object.

Earthenware. Unglazed earthenware is generally used as *chatties* for cooling water. The outside should be kept free from dust by wiping with a damp cloth, and the inside should be washed daily and rinsed periodically with a solution of permanganate of potash.

China. Glazed earthenware, China and enamel are cleaned with hot water and soapsuds and for greasy dishes soda should be added to the water. Then polish with a dry cloth. While washing cups and jugs, take special care to see that no dirt remains round the handles.

Glass. If your glassware is dirty or greasy, hot soapy water is required for washing and hot water for rinsing. Glassware must be rubbed dry and polished with a soft cloth.

Textiles. Textiles used in the household, apart from personal clothing, consist of carpets, rugs, mats, wall-hangings, mattresses, pillow and cushion covers, cloth used on upholstered articles, table cloths, table napkins, blankets, sheets and coverlets for beds, towels, and cleaning cloths. The methods of washing these fabrics are given in the section on clothing. Whenever possible, heavy textiles such as carpets, mats and rugs should be taken out of doors at least once a week to be brushed, shaken and beaten. If it is not possible to take these things out of doors, clean them indoors with a carpet-sweeper or a vacuum cleaner, or, failing that, scatter over them damp, washed tea leaves from the teapot or bits of damp newspaper or damp sawdust, and brush with a brush into a dustpan. The dust adheres to the damp material and so does not rise into the air. Always remember to empty the dustpan into a covered receptacle.

Upholstered Furniture. Upholstered furniture should be brushed with a hard brush which can get well into corners. Alternatively a vacuum cleaner can be used.

Leather. Leather is liable to become dirty as well as to crack. It may be preserved in a good condition and kept clean if a small amount of the following solution is applied occasionally: one bar of white soap dissolved in one cup of hot water mixed with one cup of alcohol and two cups of light oil.

HOW TO CLEAN A ROOM

Given a room to clean let us now see how we would organise our work. If we know how to clean one kind of room we can apply the method to all rooms.

One very important point to remember is that when you clean a room you must be sure that you remove all the dirt in it. In other words, you must remove and not scatter dust. When the floor is cleaned, admittedly some dust is swept out of the room or gathered into a dustpan or another receptacle; but what about the dust that rises into the air, and settles again on the floor or furniture as soon as the air is left undisturbed? Hence, furniture should also be dusted, but that does not mean that they can be casually 'flicked' with a duster. This leaves the surface clean for a time, until dust settles back on the furniture. The dust in the air, besides irritating our throats and getting into our eyes, sometimes contains harmful germs which we may breathe into our lungs.

The next thing to remember is that every part of the room should be cleaned at least once a week. By the term 'every part of the room' means the ceiling, the walls, the windows and doors, the tops of cupboards, furniture and the floor

CHAPTER XI

DECORATING THE HOME—INTERIOR DECORATION

INTERIOR decoration is the creative art of selection and arrangement of furniture, furnishings and accessories to meet the fundamental needs of people in their homes, and the promotion of their aesthetic values within their economic means. When tastefully carried out, interior decoration can bring about a pleasant atmosphere in the home.

IMPORTANCE OF GOOD TASTE

Good taste is the basis of interior decoration. Taste is a result of one's likes and dislikes. Some people are born with good taste. They have an eye for beauty and are capable of creating beauty through the appropriate selection and arrangement of decorative articles and accessories. Good taste can be cultivated through practice. The housewife and all the other members of the family should be educated in this art. The housewife particularly should know how to appreciate and achieve beauty through simple, artistic arrangements.

BASIC PRINCIPLES IN INTERIOR DECORATION

There are some basic principles which should be observed in interior decoration. They are design, harmony, balance, rhythm, emphasis and proportion.

Design. Design signifies line, direction, shape, size, texture and colour. Design can be classified into two categories—structural and decorative. *Structural design* denotes the structure and suitability of an article to the purpose for which it has been made, while *decorative design* is the design which is added to structural design for enhancing the beauty of the object.

A *Line* may be either straight, slightly curved or deeply curved. The housewife should be able to decide what sort of line would best suit her purpose in a particular decorative arrangement.

Direction indicates the vertical, oblique or horizontal direction in an arrangement.

Shape such as a square, a diamond and a circle is formed by applying line and direction.

Size gives the dimensions of an object. Objects may be small, smaller or smallest or big, bigger and biggest.

Texture indicates the fineness or smoothness of the material of an object ranging from superior textures, through the medium, to the coarse.

Colour helps to make a house bright and cheerful. Favourable psychological and aesthetic effects are produced by colours since they can transform darkness into light, dullness into brightness, gloominess into cheerfulness and drabness into beauty. Chastely coloured furniture and accessories such as curtains, rugs and pictures add beauty and warmth to the house. The colours used in the interior decoration of a house express the character and individuality of the housewife.

Different Colour Sehemes. Just as an object has three dimensions—length, breadth and thickness—colours also have the following three dimensions: warmth or coolness, referred to as the *hue* or the *name* of the colour; lightness or darkness, otherwise known as the *value* of the colour; and brightness or dullness, also called the *intensity* or *chroma* of the colour.

There are many colour schemes in interior decoration. According to the *Prang* scheme, all colours may be obtained from the three *primary* or *basic* colours, yellow, blue and red.

When two primary colours are mixed in equal proportions, a *binary* or a *secondary* colour results as shown below:

Yellow	+	Blue	=	Green
Blue	+	Red	=	Violet
Red	+	Yellow	=	Orange

When a primary and neighbouring binary colours are mixed the following six *intermediate hues* are obtained:—

Yellow	+	Green	=	Yellow—green
Blue	+	Green	=	Blue—green
Blue	+	Violet	=	Blue—violet
Red	+	Violet	=	Red—violet
Red	+	Orange	=	Red—orange
Yellow	+	Orange	=	Yellow—orange

The three primary hues, the three binary hues and the six intermediate hues form the outer circle of the Prang colour chart.

When two binary colours are mixed a *tertiary* colour results as indicated below:

Green	+	Orange	=	Tertiary Yellow
Orange	+	Violet	=	Tertiary Red
Violet	+	Green	=	Tertiary Blue

When two tertiary colours are mixed in equal proportions a *quarternary* colour will be the consequent product.

Tertiary Yellow	+	Tertiary Red	=	Quarternary Orange
Tertiary Red	+	Tertiary Blue	=	Quarternary Violet
Tertiary Blue .	+	Tertiary Yellow	=	Quarternary Green

Use of Colours. Different colours have different characteristics. They should be used in the house according to the particular purpose of a room or situation in the house. For example, the bed room should have quiet colours such as blue, blue-green, pink, light yellow and cream, because it is the room where one rests or relaxes. The dining room should have cool and restful colours, so that the members can be relaxed and happy while eating. The kitchen should be coloured with white or any gay colour which will break the monotony of cooking. The living room should have cheerful colours such as pink, green, orange or yellow and the bath room, fresh clean and stimulating colours such as cream, white or light pink.

There should be harmony in the use of colours. Harmony is the principle which produces an impression of unity through the selection and arrangement of objects and ideas which are consistent in the various components of art. There are two types of harmony in colours: harmony of related colours and harmony of contrasting colours.

Harmony of related colours can be achieved through the use of *monochromatic* or *analogous* colours. Monochromatic harmony is one hue or mode harmony. This is achieved by using the same colour in different shades. Analogous harmony is achieved by using neighbouring colours in the Prang colour chart. By the application of monochromatic or analogous harmony a sense of continuity in the home is brought about.

Contrasting colour harmonies can be obtained through the following four ways:

1. *Complementary harmony* which is obtained by using those colours which are directly opposite each other in the Prang colour chart.

2. *Double complementary harmony* which is achieved by using any two adjacent colours on the Prang colour chart with their complements.

3. *Split complementary harmony* which is obtained when a primary or an intermediate colour is used with the colours on either side of its complement.

4. *Triads*. The colours forming the points of the four equilateral triangles in the Prang colour chart constitute the Triads.

The size, aspect and orientation of a room should be considered when applying colours. If a room gets too much sunshine, a dark colour may be used to subdue the light. In hot climates, light, cool colours of low intensities should be used. In small rooms, light colours give an impression of largeness. A low ceiling will appear higher if it is of a lighter hue than that of the walls.

Harmony. Harmony in interior decoration also embraces five aspects: shape, size, texture, idea and colour.

Balance. A balanced arrangement provides a sense of restfulness and repose. This is attained by grouping shapes and colours around a central point in such a way that the general effect has a semblance of equilibrium.

Rhythm. Rhythm is a form of movement in art. However, not all movements in design are rhythmic. In art, rhythm means a connected path along which the eye may travel in any arrangement of lines, forms or colours.

Emphasis. Emphasis is the art principle by which the eye is carried first to the most important point in any arrangement. From that point, the eye travels to every other detail in order of importance.

Proportion. The principle of proportion is sometimes called the *law of relationship*. This principle has to be observed while arranging the objects in the house.

ARTICLES USED FOR INTERIOR DECORATION

Pictures, curtains, flowers, plants, containers, furniture, draperies, hangings such as scrolls and a number of other objects are used in interior decoration.

Pictures. The selection of pictures also reflects the taste of the housewife. While selecting the pictures she should think of the room in which they will be hung. The desirable characteristics in pictures are: an organised theme, good pattern and a pleasing colour scheme.

The verandah, the hall or the living room often serves as a place for receiving visitors. Therefore the pictures placed in these rooms should be of general interest. Personal photographs and calendars should never be placed in a haphazard manner.

The bed room is a place of rest and intimacy for the members of the family. Therefore pictures of personal interest can be chosen for this room. Pictures placed in a dining room should be cheerful, having themes which will enhance the appetite. Paintings of fruits, birds, fish and flowers are most appropriate.

In the study room, pictures should not distract one's concentration. They should be able to stimulate clear and original thought and have many educative values.

Pictures should be hung flat against the wall at the eye level of the viewer. Only then can people see and enjoy them comfortably. There must be sufficient wall space around pictures. There are various arrangements for hanging pictures, as shown in Figure 31. The string used for hanging pictures should not be visible.

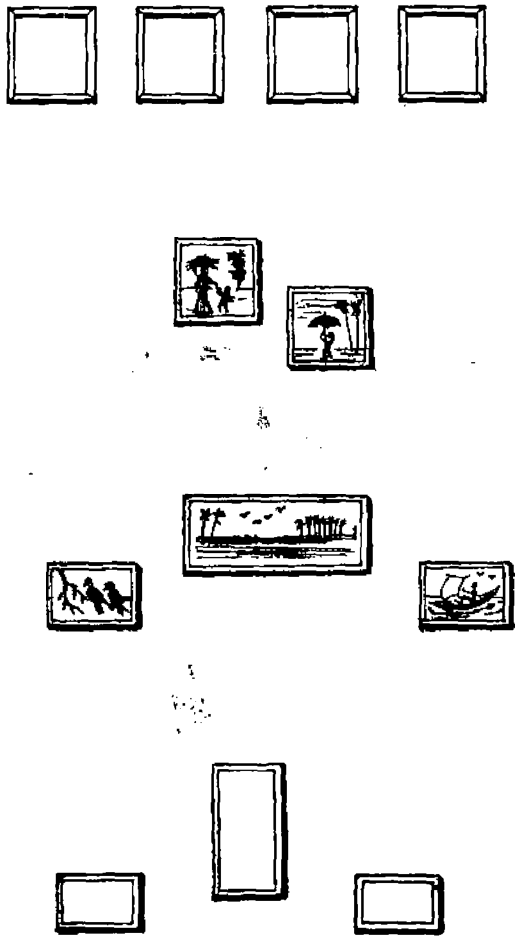


FIG. 31. Wall-picture arrangements

Curtains and Cushions. Curtains and draperies are used for regulating light, heat and noise and also provide privacy. They are also used as space-dividers without occupying much space. Other room-dividers can be made out of cloth, wood panels, carvings and even creepers.

For large rooms, curtains with large designs should be used and vice versa. The design should be in harmony with the colour of the room as well as with furniture and other accessories.

Cushions are used for comfort and relaxation. They lend charm and colour to the room. They can be of different shapes and materials. They must be in harmony with the other objects used in the room. The textiles used for cushions and curtains should be durable, washable or easily cleanable.

Flowers. There is nothing so beautiful, attractive, elegant and colourful as fresh flowers. They are loved and admired by all. Flowers add glamour and charm to interior decoration. The knowledge and skill of artistic flower arrangement is a valuable tool for decorating rooms tastefully.

There are several ways of arranging flowers to enhance the beauty of the house. The different designs may be in the shape of a circle, hemisphere, equilateral triangle, triangle to the right, triangle to the left, shaped curve, and torch-shaped as shown in Figure 32. The principles of design such as colour, harmony, balance, rhythm and proportion, when applied in flower arrangements, also obtain pleasing effects.

The articles required for flower arrangement are vases, holders, scissors, water and accessories. When selecting a flower vase for a room, the housewife should remember that it should be in harmony with the size and colour scheme of the room and also the flowers used. It should not spoil the beauty of the flowers arranged because of its design and gaudiness.

Flower arrangements can be combined with other

FIG. 32. Flower arrangement designs

arrangements consisting of dry twigs, creepers, fruits and vegetables (Figure 33).

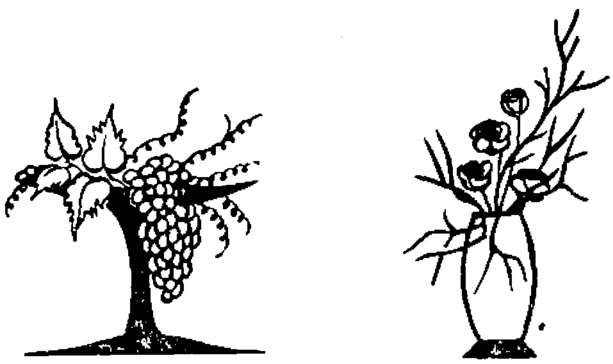


FIG. 33. Arrangements with fruits and twigs

Plants. Plants find a place in any part of the house as decorative pieces. They add liveliness to the rooms. Potted plants can be put on the teapoy, book shelf, window sill and on walls. Plants kept in a room should always harmonize with the decor of the room in which they are kept.

Furniture. Furniture is intended for comfort, rest and relaxation. It should have a good structural design. In selecting and arranging furniture in a room one should be guided by the principles of utility, appropriateness and design such as scale, rhythm and harmony. The arrangement of furniture should create an impression of spaciousness in the house. The various articles of furniture should harmonize with each other and with the room in size, shape, texture and colour. The arrangement of furniture should add comfort, beauty and dignity to a room.

Other Articles. Apart from the items mentioned above, a variety of many other attractive articles are available for decorating the house. These include pin trays, book ends, table covers, mirrors, clocks, lamp shades, dolls and other objects, some of which can be made at home. In selecting these articles one should be conscious of the need for beauty and economy and the avoidance of cluttering. Even ordinary things in daily life such as stones, shells from the sea, coconuts and eggs, fibres and twigs can become decorative accessories if they are used with imagination.

WHERE AND HOW TO DECORATE

The decoration of any room consists mainly of the decoration of floors, walls and ceilings.

Decoration of the Floors. Four types of decoration are available for floors—kolam, rangoli, alpana and flower carpet.

Kolam (Figure 34) is a free-hand drawing of various indigenous designs on all types of floors. For drawing kolam, either white stone or chalk powder, white or coloured sand or a solution prepared by mixing rice flour with water is used. There are different types of kolams—dotted, lined and their themes. While white powder or white solution is generally used, red mud solutions and other colours are used on special occasions to highlight borders and centres of interest.

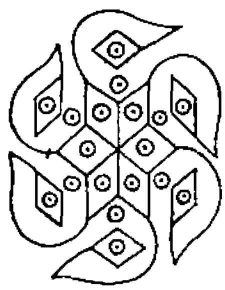


FIG. 34. Kolam

Rangoli (Figure 35) is designed on a pattern which has been previously drawn on floors. Coloured dry powders

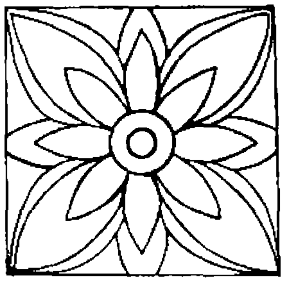


FIG. 35. Rangoli

which are usually made from rice flour are used. The rice flour is mixed with different colours and used for different parts of the design.

Alpana (Figure 36) has also been an old traditional floor design. The entire design is painted with white paint.

FIG. 36. Alpana

In the case of the *flower carpet* (Figure 37) the design is drawn on the floor, and different coloured flowers or their petals and green leaves are arranged on different parts of the design. In order to keep the arrangement firm, wet sand is spread evenly over the design, which is also used as the base for placing the flowers.

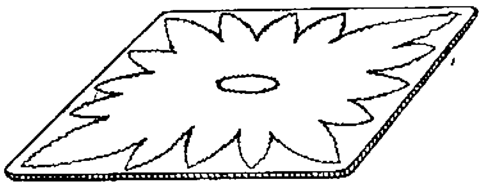


FIG. 37. Flower carpet

Decoration of the Walls. The walls of the house can be decorated with various pieces such as pictures, wall plates, calendars, wall vases and the figures of birds and beasts.

Decoration of the Ceiling. The ceiling of any room can be decorated with colour and lamp shades.

Interior decoration will be complete and satisfactory only when all the parts of the house are decorated in harmony with each other. Taste, expressed through the application of the principles discussed in the chapter, will make the home interesting, cheerful, lovely, satisfying and educative.

ASSIGNMENTS

1. Observe the colours used for the different rooms in your house. How do they fit in the Prang colour system? Are they in harmony?
2. Paint a picture, mount and hang it in a suitable place in your house.
3. Make different flower arrangements and exhibit them.
4. Observe the furniture arrangement in the different rooms of your house and school and evaluate their effects.
5. List the various art objects that can be used for interior decoration in your home.
6. Decorate the floor of your house or school with kolam, rangoli, alpana and flower carpet, according to the need and occasion.

CHAPTER XII

FUNCTIONING OF THE HUMAN BODY

THE study of the functioning of the human body is known as the science of human physiology. We often wonder how people breathe, talk, eat, see, feel and move, and what happens to the food we eat; how they derive energy for various activities and how life goes on from one generation to another. Answers to these and many other questions constitute the science of life. Physiology explains how the different activities are performed in the body. Several external features and inner structures are responsible for the functioning of the body. They are classified as the following different systems:

1. Skeletal
2. Muscular
3. Nervous
4. Endocrine
5. Circulatory
6. Digestive
7. Respiratory
8. Excretory
9. Sensory
10. Reproductive
11. Integumentary.

1. *Skeletal System.* The skeletal system forms the basic structural frame for all vertebrates. It is responsible for maintaining the form and structure of man. It consists of bones, cartilage and ligaments. Man's erect posture and his capacity for motion are made possible by his skeleton. The skeleton also protects and supports the other organs and systems in the body.

2. *Muscular System.* All physical activities such as skeletal movement, contraction of the heart, contraction of the blood vessels and peristalsis involve muscular work. Three different kinds of muscles function in the body:

the skeletal muscles, the cardiac muscles and the smooth muscles. All three types have some specific characteristics in relation to their functions.

Skeletal Muscles. The skeletal muscles are composed of long and slender multi-nucleated cells shown in Figure 38, called muscle fibres. These muscle fibres form the muscles. The muscles are attached to the bones of the joints which are movable. The skeletal muscles are also called *striated* muscles. They are responsible for the movement of the different parts of the body by the movement of the skeleton. These movements are controlled by the nerve impulses transmitted from the brain. Hence, these muscles are also known as *voluntary muscles.*

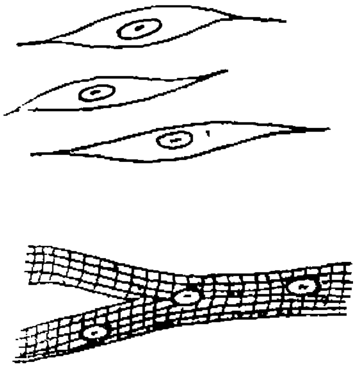
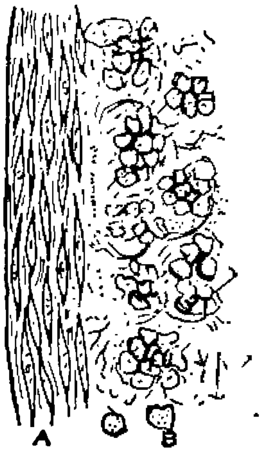


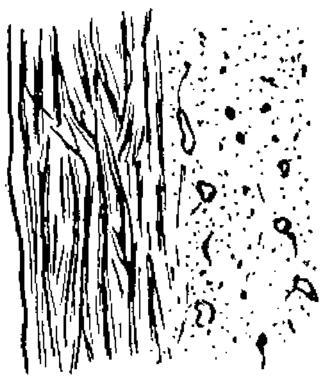
FIG. 38. Muscle fibres

Cardiac or Heart Muscles. The heart is a large muscle mass responsible for pumping blood in and out of it. The heart muscle tissue is different from other muscle tissues in that it possesses some intrinsic properties and unique features such as a high degree of rhythmicity and rapid and forceful contractions. The distinctive characteristic of the heart muscle is its arrangement which enables an impulse originating at one point in the heart to spread throughout the muscle mass, making the whole heart contract with every beat.

Smooth Muscles. Smooth or *visceral* muscles (Figure 39) are found in the organs which help to control the internal environment such as the walls of the stomach, blood vessels, intestines and bladder. They are extremely variable in appearance. They have no striated appearance and



Longitudinal section of a visceral organ to show smooth muscle tissue.
A. Longitudinal section.
B. Cross section.



An injected longitudinal section of the wall of a visceral organ to show smooth muscle tissue.

FIG. 39. Smooth muscles

hence have the name *smooth muscles*. They have a high degree of plasticity. Their movements are not controlled by nerve impulses. They act involuntarily without any stimulus. Therefore they are known as *involuntary muscles*.

3. *Nervous System*. All the activities of the body are co-ordinated and controlled by the nervous system which is composed of the central and peripheral units. The central nervous system consists of the brain and the spinal cord; the peripheral nervous system includes the cranial nerves and the spinal nerves. Some of the nerve fibres convey

information from the receptors to the central nervous system through the afferent nervous system. On the other hand, the efferent nerves convey information from the central nervous system to the effectors. The central nervous system may be compared with the chain of command in an army. There are so many levels of command to which the different nerves carry orders. The everyday matters are dealt with at a lower level (spinal cord). More serious occurrences are referred to the higher levels for decisions. Sometimes the very highest level is called to impose a general policy on the lower levels that normally 'go by the book'.

4. *Endocrine System.* The nervous system operates in conjunction with the endocrine system. The hormones which are the secretions of the endocrines are effective in bringing about a regulatory action. The endocrine glands influence growth, development and behaviour.

5. *Circulatory System.* The circulatory system is concerned with the supply and collection of blood from different parts of the body. It consists of the heart, the blood vessels and the blood itself. Blood is concerned with the maintenance of the fluid balance in the body, immunity and resistance to disease. There are two types of blood vessels: the arteries and the veins.

6. *Digestive System.* Digestion is the process by which food is changed to an absorbable form through a series of processes which are collectively known as *metabolism.* The digestive system consists of the mouth, oesophagus, stomach, small intestines and the large intestines (Figure 40).

The major function of the digestive and metabolic processes of the body is to provide energy and nutrients for performing the various functions of the body. Energy is required for all the activities, including sleep. It is also needed for muscular contraction.

Carbohydrates, proteins, fats, vitamins and minerals are required for the building up of various structures in the body, and the synthesis of special chemical compounds

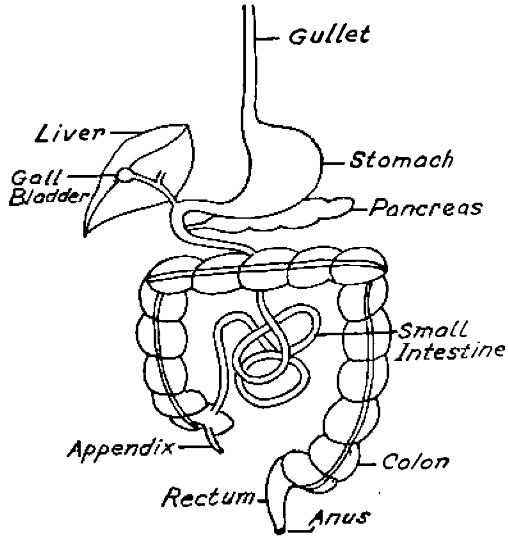


FIG. 40. Digestive system

called enzymes and hormones. Nutrients are essential not only to build up the body structure but also to repair worn-out tissues and maintain good health.

Mouth and Oesophagus. In the mouth, the food is chewed with the help of the teeth and mixed well with a secretion called *saliva*, which helps to moisten and lubricate food. Saliva has an enzyme called ptyalin which breaks down starch to yield smaller and more digestible units called *maltose*. After chewing, the tongue pushes the chewed food at the back of the mouth into the pharynx and on to the oesophagus.

The oesophagus is a tube connecting the pharynx to the stomach. Due to special movements called *peristatic contractions* food passes into the stomach. At the junction of the stomach and the oesophagus there is a valve called the *cardia*, which remains closed except when the food reaches the stomach. Thus the valve prevents the regurgitation of food from the stomach.

Stomach. The stomach has two parts: the slightly distensible *fundus*, and the more muscular *antrum* which mixes the food. The stomach performs three interrelated functions: storage of food, secretion of the digestive fluid, *gastric juice*, and mixing of food.

Gastric Secretions. The principal components of the gastric secretions are hydrochloric acid and the enzymes, pepsinogen and renin. The centre of the stomach secretes mucous which is a smooth fluid, and the enzyme renin which coagulates milk. Hydrochloric acid helps to purify the food. It also protects the lining of the gut from the action of digestive juices.

Small Intestines. Food thus liquefied passes as *chyme* into the small intestine by peristalsis. In the first portion of the small intestine, the breaking-down processes are completed by the enzymes present in the pancreatic and intestinal juices. In the lower section, the soluble products of digestion are absorbed and the breaking-down processes continue. The absorption of nutrients takes place in the finger-like projections called *villi* (Figure 41) which contain loops of small blood capillaries and small lymph vessels called lacteals.

Large Intestines. The main activity in the large intestines is the re-absorption of water and salts from the liquid *chyme*.

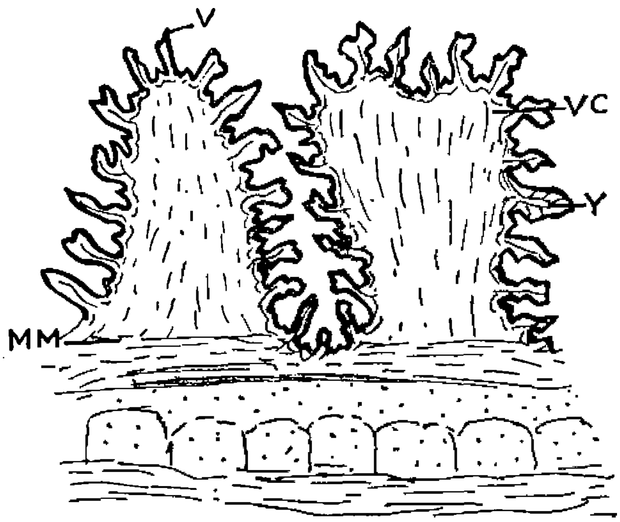


FIG. 41. Longitudinal section of small intestine
MM: muscularis mucosae; V: villus;
VC: valveucle conniventem; Y: nerve net.

The undigested residue which is partially dried is compacted in the rectum as *faeces* and ejected out periodically.

Absorption. The end products of digestion are glucose and other mono sugars from carbohydrates, amino acids from proteins and fatty acids and glycerol from fats. The intestinal wall has an enormous area facilitating the absorption of nutrients through the villi. The capillaries drain into the portal blood circulation, which passes through the liver before returning to the heart. The liver regulates the glucose and amino acid levels of the circulating blood by removing the excess during periods of absorption from the gut, and by releasing them during periods of scarcity. Most of the lipoid materials absorbed into the villi pass into the lacteals. The lymph drains through many lymph nodes studded along the intestines and enters the thoracic duct, from where it is returned to the blood circulation which distributes all the nutrients to every part of the body.

7. *Respiratory System.* The respiratory system is composed of the nose, pharynx, glottis, trachea and lungs (Figure 42). Through the respiratory system, oxygen is supplied to the blood, and carbon dioxide which is the end product of metabolism is removed. When blood carries oxygen to the cells, metabolism is facilitated. Carbon dioxide is produced because of the combustion taking place which releases energy.

The air from outside passes through the nose into the pharynx, glottis and the trachea or windpipe. The trachea divides into two bronchi which end in the two lungs enclosed in the padded thoracic cavity. The lungs are composed of numerous alveoli with membranes separating them. The capillaries transport the blood carrying carbon dioxide to the lungs, where the carbon dioxide diffuses into the red blood cells from the plasma and combines directly with haemoglobin and forms carbamino haemoglobin. Thus haemoglobin acts as a carrier of carbon dioxide also. When that blood enters the pulmonary capillaries, the chemical combination of carbon dioxide with the haemoglobin is reversed. Carbon dioxide is released in the alveoli and is passed out through the nose during expiration. The object of breathing is thus to move the air continuously in and out of the alveoli and thereby maintain a fresh supply of alveolar oxygen and removal of accumulated carbon dioxide.

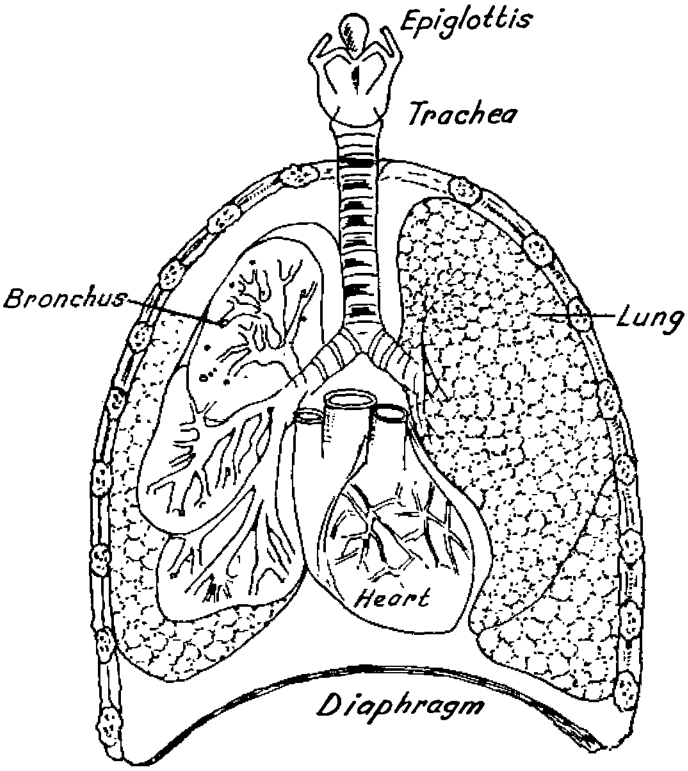


FIG. 42. Respiratory system

8. *Excretory System.* The kidneys form an important part of the excretory system. They remove the end products of digestion, metabolism and respiration. The end products are excreted through faeces, urine and perspiration.

9. *Sensory System.* The sensory system consists of the organs of hearing, touch, taste, smell and sight. All the organs are responsible for perception, feeling and for the proper reception of stimuli and direction of responses to the environments.

10. *Reproductive System.* The reproductive system ensures perpetuation of the species. The male organ of the reproductive system produces the spermatozoa and the female the ova eggs. Sexual reproduction requires the union of these two sex cells. The male system has a mechanism for the transfer of sperm cells to the female reproductive tract which makes it possible for the union of the sperm with the ova and for the protection of the fertilized egg.

11. *Integumentary System.* The human body is covered by skin or integument. It is composed of a number of layers which contain hair, pigment, blood vessels, nerves and glands which secrete water or oil products. The skin protects the body and the internal organs. It prevents the entry of bacteria and other disease germs into the body and is an excretory organ as well. Furthermore it is important as a sense organ for it is capable of receiving the stimuli of heat, cold and touch.

Assignments

1. What are the different systems involved in the functioning of the human body?
2. How is food digested, absorbed and transported in the body?
3. How does respiration take place?
4. How are the different activities of the body co-ordinated?

CHAPTER XIII

HEALTH HABITS AND PERSONALITY

Since 'health is wealth', one must make all possible efforts to maintain one's health in the optimum condition. In the maintenance of health, food plays a vital role. However, there are some other requirements also such as: maintaining a balance between the different functions of the body; cleanliness in all aspects, such as living in sanitary conditions; rest and exercise at appropriate intervals; the maintenance of a good posture, which is the position of the body or how one carries one's body while standing, sitting, in motion or at work. Above all, one should develop and practise healthy habits from childhood for acquiring a sound personality.

CLEANLINESS

We have already discussed the importance and means of cleanliness in the home and its surroundings. Personal and environmental cleanliness are assets to one's personality. Personal hygiene requires proper care of different parts of the body—the skin, teeth, mouth, eyes, nails, ears and hair.

Skin. The outer layer of the skin and nails is known as the *epidermis* and the layer below as the *dermis.* The sweat glands are situated in the dermis. They consist of tiny coiled tubes ending in ducts called *pores* which have their openings on the surface of the skin. If the skin is not washed regularly, the fluid which passes through the pores from the sweat glands hardens and blocks the pores, eventually causing irritation and possibly an outbreak of pimples. The process of sweat passing through the pores of the skin is a continuous one. Sweat leaves a salty coating on the skin and on clothes. Unless this coating is washed off daily, the pores get clogged. A daily bath is therefore important. Wash the body thoroughly paying particular attention to the armpits and the groin. In order to protect the skin from roughness, oils, creams, pastes and lotions can be used after consulting a doctor or by careful selection. A person having any contagious disease of the skin should have a separate set of toilet items and clothing and avoid handling articles which are commonly used by others.

Teeth and Mouth. The teeth and tongue are accessory organs in the mouth. They play an important role at the beginning of digestion by breaking down food particles and mixing them with saliva. Good health is as essential as cleanliness.

The enamel of the teeth is destroyed by acids present in particles of food left in the mouth. They cause tiny holes or cavities. Therefore, rinsing the mouth is necessary before and after eating any food. Cleaning can be done by using a suitable tooth brush and tooth paste. A tooth brush should be small, having firm short bristles that reach all the corners of the mouth. Teeth should be brushed up and down rather than across. Salt, sodium bicarbonate or precipitated chalk are effective for cleaning the mouth and the teeth. The mouth must be rinsed thoroughly with clean water.

Most children eat snacks or sweets frequently between meals. It is important that they should be taught to avoid this habit and to rinse their mouths often.

Eyes. Eyes reflect the state of health of a person. During an illness, the eyes may water more freely and appear glassy. As health returns, the eyes also regain their normal appearance. Using good light during reading and working will protect the eyes. If it is thought necessary to use eye glasses it is desirable to have the eyes examined by an opthalmologist. Oculists and opthalmologists are physicians and can assess difficulties in vision.

The use of dark glasses is becoming popular. The best type is that which is made of ground glass. If the patient wears glasses regularly it is best to have the dark ones made from the same prescription given by the opthalmologist. This will avoid the need to wear both sets. Clip-on dark glasses are not satisfactory since they may scratch the lens and are not able to prevent light from entering at the sides.

Eye Drops. There are some patent solutions in the market for relieving tired, strained and inflammed eyes. Most of them are harmless but they should be used with caution, since some people suffer from a marked irritation after their use. Avoid eye drops unless they have been prescribed by a physician.

Nails. The nails are accessory structures of the skin. The body of the nail is the exposed portion and the root lies in the skin in the nail groove from where the nail is nourished. Finger nails can be trimmed in an oval shape. Filing nails too far down the sides may injure the skin around the nail. Toe nails are cut square to prevent ingrowth which is both painful and difficult to remove without injuring the surrounding tissue. Hanging nails are broken pieces of cuticle which should be removed by cutting or prevented by pushing the cuticle back gently with a blunt instrument or with a towel after washing the hands. Cleaning under the nail is accomplished by using a blunt instrument.

Ears. If a wax plug is present in the auditory canal it may be removed by gently syringing the ears with the physician's approval. Using sharp articles, such as a hairpin, to remove wax is extremely dangerous since the eardrum may be punctured. After the ears are washed they should be dried carefully with the edge of a clean cloth or towel so that the water and wax are removed by capillary action. Forcing the towel into the ear for drying may aid the formation of the wax plug.

It is the doctor's responsibility to remove foreign bodies which have lodged in the auditory canal. He will usually irrigate it until the foreign body is washed out. Instrumentation is rare because of the danger of injuring the ear. Normal saline is usually used unless the foreign body is hygroscopic, that is, it absorbs water, swells and becomes even more difficult to remove. Since beans and other seeds are hygroscopic in nature, alcohol is generally used for irrigation. Drugs in solution are placed in the auditory canal for their local effect. They are used to soften the wax, relieve pain, kill insects or destroy organisms present in the canal and act as local anaesthesia. The type of solution and the amount should be in accord with the prescription of the doctor.

Hair. Hair is formed in the follicles as little tubes folded into the skin. At the bottom of each follicle is a bulb-shaped structure connected with blood vessels from which the hair cells grow. The new cells push the old ones up the follicle and these old cells then undergo a process called *keratinization* which turns them into hair.

Cleanliness is one of the most important aids in keeping the hair attractive. Hair should be brushed or combed thoroughly every day with a clean hair brush or a fine tooth comb to prevent accumulation of dirt. Brushing also stimulates the circulation of blood in the scalp and keeps away lice. Combs with sharp teeth should be avoided because they may scratch the scalp. The hair should be washed at least once a week with a shampoo or by using soap-nut powder as in an oil bath. It is important to keep hair free from dandruff. Having a separate comb for each person and the avoidance of contact with a person who has lice are some of the preventive measures.

Eating. Eating nutritious meals in pleasant surroundings without wasting or spilling is important. One should enjoy one's meals, sitting properly at meal time and being engaged in cheerful conversation. The utensils carrying food should be kept clean and covered. They should be adequate for serving and eating purposes. The place selected for eating should be kept clean, having no flies, mosquitoes and undesirable odours. Before and after eating, the mouth, hands, spoons and plates should be washed thoroughly.

Food must be chewed well. Spitting and speaking with food in one's mouth are not courteous habits. Drinking water must be boiled, cooled and kept in a clean vessel. Drinking too much water during meal times should be avoided.

Rest and Exercise. In order to alleviate physiological fatigue, there must be a cessation of physical activity for an adequate length of time. This cessation is known as *rest.* Periodical rest allows time for the removal of the products of fatigue from the body. Resting in a clean place will help the body and mind to relax. Relaxation, in turn, will increase the output of one's work.

Instead of resting frequently during the day or for a long period at one time, one can refresh oneself by introducing interesting changes into one's routine job or by doing exercises. Proper exercising of the body as part of the day's routine is necessary in order to keep fit. Suitable exercise will maintain the different parts of the body in proper health and vigour. The best time to do exercise is during the early morning. Walking a considerable distance, skipping, running, dancing, swimming and playing are all good forms of exercise. For girls, the household activities which involve the movement of different parts of the body such as sweeping, laundering and arranging kolam or rangoli are good exercises.

Sleeping. Sleeping at regular times should be practised. One who maintains regular timings for going to bed and rising up can easily control all other activities. One should know how to make a bed properly and neatly. Sleeping on the back with the limbs in a relaxed position is a posture that provides rest. One should not breathe through the mouth while sleeping. In the early years children should be safeguarded against bed-wetting and sleep-stammering so as to be free from such tensions. One should never have eatables in one's mouth while sleeping.

Breathing. No one should breathe through the mouth. Inspiration and expiration should be carried out properly and rhythmically. If there is any difficulty noted in breathing, swallowing or coughing, a doctor should be consulted immediately.

Bathing. Having a bath daily is a necessity. A bath gives fresh vigour to the body by removing the dirt, and to the mind by stimulating the muscles. Bathing in cold or warm water and using cleansing agents, whether it be soap or soap-nut powder, should become a regular habit. After cleaning the body with water, wiping with a clean towel is very important. Using towels which have already been used by others should be strictly avoided because this habit only helps to spread contagious diseases when they are prevalent.

BODY MECHANICS

Body mechanics is a term now used in the place of *posture* since it suggests a relationship with the functions of the body. Body mechanics determines the feelings of comfort and discomfort associated with the use of the muscles and the skeleton. The principles of body mechanics are:

1. Keeping the parts of the body in alignment;
2. Using muscles effectively;
3. Rhythm;
4. Considering the centre of gravity, both of the body and of articles handled, and
5. Taking advantage of momentum.

These five aspects are interwoven in the actual use of the muscles of the body.

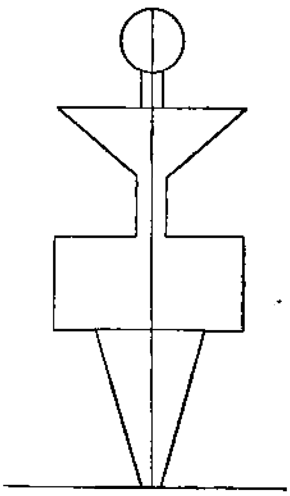


FIG. 43. Correct posture

Keeping the parts of the body in alignment results in stability when the weights of the various parts of the body are correctly positioned, each centred over the base of support as in Figure 43. In a correct posture, whether it be standing, sitting or bending, the respective muscles are in operation. In an incorrect posture, muscles which are not so constructed are set into action, resulting in unnecessary strain and fatigue. Therefore one should practise standing straight or sitting in the correct manner without bending the back or allowing the body weight to be felt on any one side, which will result in a hunch-back or one side or limb of the body being shorter or longer.

Using muscles effectively includes the use of the strongest muscle feasible, positioning oneself to perform the action, contracting the muscles slowly and using them rhythmically. The leg muscles, being stronger than the back muscles, should be used for lifting load from the floor without bending the back.

Rhythm is a muscular performance in a repetition of movements at the same tempo. Rhythmic work is less tiring than non-rhythmic work. For example, in sweeping and mopping the floor, polishing different surfaces, dish-washing or ironing, there are possibilities of a regular flow of motion, which will keep up the vigour of the body for a long time.

Considering the centre of gravity is of importance in lifting, supporting or carrying a load and also in reaching to get an object. It is preferable to keep the load close to our bodies as we would while carrying a baby in our arms. Keep the centre of the weight of the object through the centre of your body, without twisting the body. Applying force to the centre of gravity of a load to be moved is the right method.

Taking advantage of momentum means avoiding stops and starts and of changes of speed. Free-flowing motions are the least fatiguing. The waving of a flag in the breeze is an example of this movement. Thus, in dusting or polishing a surface, the end of each movement may be rounded to make the stroke a continuation of the forward one.

Using uncomfortable footwear, wearing dresses which are inconvenient and adopting unusual ways of walking or movements of the body in the name of fashion should be avoided in order to have a good posture and personality.

All the principles which are essential for our health should be observed in our daily routine. Healthy habits will then ensure a commendable personality.

Assignments

1. Plan a chart to mark the cleanliness of the pupils in your class.
2. Discuss the contagious diseases of the skin and the preventive measures for them.
3. What are the requisites to be provided to bring about correct eating and drinking habits in schools?
4. Discuss the unhealthy habits practised by your classmates and give suggestions to correct them.
5. Check your posture and try to bring the attention of your juniors to the right type of posture.

CHAPTER XIV

HOUSEHOLD PESTS AND THEIR ERADICATION

NUMEROUS insects, rodents, reptiles and other pests invade the home and cause many harmful effects. Their classification, mode of action and eradication are discussed in this chapter.

INSECTS AS CARRIERS OF MICRO-ORGANISMS CAUSING DISEASES

Some insects bring micro-organisms into the house which are responsible for many diseases, of which malaria, enteric fever, plague and cholera prevail in our country. The mosquito, sand-fly, bed-bug, flea, house-fly, ant, cockroach, moth, silver fish, book-louse, cricket, wasp, white ant, and rats, mice, lizards, spiders and snakes are the common household pests. Insect enemies may be divided into those which do harm by (1) sucking blood; (2) infecting food and (3) damaging property.

INSECTS WHICH HARM US BY SUCKING OUR BLOOD

(*a*) *Mosquitoes.* The female mosquito sucks human blood and causes malaria, filaria and other diseases. Two varieties of mosquitoes cause specific diseases. They are the *culex* and the *anopheles.* A third common variety is the speckled or striped black and white *stegomyia,* also called the 'Tiger mosquito'. The female of the common culex mosquito deposits her eggs on the surface of stagnant water, preferably where she can find a stray leaf or a bit of grass on which she can sit. She lays a mass of about three hundred eggs at a time.

The eggs of the anopheles are found separately, arranged in geometrical designs. After twenty hours, in both types, little swimming larvae appear, which spend about seven to fourteen days wriggling in water, coming up frequently to the surface to breathe. At the end of the larval period, a change takes place : the head of the larva increases in size and the whole body takes the shape of a comma, called a *pupa*. The pupa spends its time tumbling over and over in the water. Between two to five days, the pupa splits its skin and a full-grown mosquito flies away.

The natural food of the mosquito is the juice of plants. But the female insect sucks the blood of animals and men, whenever she gets a chance. When a man suffers from certain infectious diseases, the germs of that disease are found in his blood. When a mosquito sucks his blood, it takes into its stomach both the blood and the disease organisms. When it bites another person, it deposits these disease germs in his blood stream. The anopheles carries the germs of malaria. The stegomyia spreads yellow fever which is common in the West Indies. The culex, which is most common in our country, inflicts an irritable swelling and spreads dengue fever. The culex also spreads filariasis which is ordinarily known as *elephantiasis* because of the large swellings on the legs and limbs.

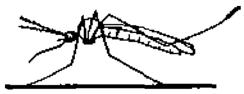


FIG. 44. Culex

At rest the culex holds its body parallel to the plane of the object on which it is resting as shown in Figure 44. The anopheles holds its body at an angle (Figure 45). The wings of the anopheles are spotted. The culex is more commonly seen, as the dangerous anopheles mosquito loves the dark and usually waits till then to come out of its hiding place. But the culex, though it favours the dark, does not strongly dislike the light; some varieties of mosquitoes seem to be attracted by lamp light.

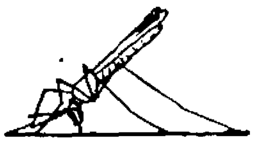


FIG. 45. Anopheles

HOW TO ERADICATE MOSQUITOES

1. Fill up or cover all possible breeding places and destroy all the filth there. Fill up useless pools, puddles and hollows. Bury or destroy all old tin cans or other unwanted receptacles for water. Cover rain barrels and small cisterns.

2. Lakes and tanks should be kept clean and larvae-consuming fish should be bred in them.

3. Kerosene oil should be sprayed on the surface of unavoidable pools near dwellings every week or once in ten days. Spray a few drops of kerosene on the surface of a tub of water. You will observe that the oil forms a thin film over the whole surface through which the larvae cannot breathe. Consequently, they die.

4. Use mosquito nets at night.
5. Close your windows as soon as it begins to get dark.
6. Do not sit in dark places. If you must, spray or rub a repellent on the exposed parts of your body.
7. Spray kerosene oil emulsion or patent mixtures in places where mosquitoes congregate.

8. Sprinkle a few drops of eucalyptus, citronella or turpentine on cloth near the area in which you are sitting or on your pillow if you are obliged to sleep without a net. If you wish to apply it on your skin, mix it with olive oil.

9. Burn incense and *neem* leaves in rooms where mosquitoes are a nuisance, particularly when it begins to get dark. See that the smoke goes under chairs, tables and sofas.

10. If a house is badly infested with mosquitoes attract all the mosquitoes into the house, leaving all windows and doors open at dusk and during the evenings and early mornings. Then, close all doors and windows shutting the mosquitoes in. By means of smoke or sprayed kerosene oil emulsion or any patent insecticide, clear them out of each room and passage till they are all assembled into one small room. Fill this room with very dense smoke or spray it heavily. Keep the doors shut. Later, sweep the corpses. Do not burn leaves and spray at the same time, because sprays are usually inflammable.

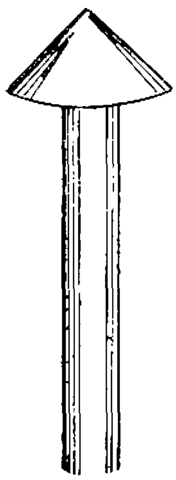


FIG. 46. Cover for outlet gas pipe

11. The male mosquito lives for two or three weeks, while the female has a longer life-span of four to twenty weeks. She can live without food for a long time, hiding for months in dark cupboards. Therefore you should spray all cupboards once a week to be sure that you kill all the adult mosquitoes.

12. One of the most popular breeding places of the mosquito are the septic tanks attached to flush-out latrines. The simplest way of controlling the emergence of mosquitoes from septic tanks is to cover the pipes for

the outlet gas from the septic tank with thin cloth (Figure 46).

13. Kill the mosquitoes in the larvae stage also. Incense, camphor, naphthalene balls, *neem* smoke or smoke of tobacco leaves may be used to keep away mosquitoes.

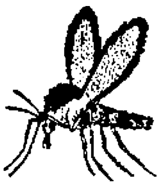


FIG. 47. Sand-fly

(*b*) *Sand-fly.* The sand-fly (Figure 47) is a fine little biter. In certain parts of India it causes a three or four-day fever known as *sand-fly fever.* As in the case of the mosquito, micro-organisms enter the stomach of the insect from the blood of a victim, and are transmitted through the sand-fly's mouth to a healthy person.

The sand-fly is frequently found in dirt collected in old walls and roofs inside houses. It also breeds in damp earth. To prevent the propagation of the sand-fly, it is necessary that houses are kept clean and proper repairs done to any broken crevices in which dirt may accumulate. Where there are rafters, they should be frequently cleaned. Unavoidable damp places around the house should be sprayed with a solution of formalin.

If, with all these precautions, sand-flies abound, sleep under a fine mesh net. The sand-fly can enter through the mesh of an ordinary mosquito net.

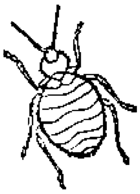


FIG.48. Bed-bug

(*c*) *Bed-bug.* The bed-bug (Figure 48) is one of the most unpleasant and repulsive insect enemies of man. They make their homes in crevices of walls, floors, bedsteads and other furniture. They live wholly on the blood of human beings and require a blood meal every five days or so. They can, however, remain in a quiescent state for several months. Besides being blood-suckers, dirty and unpleasant, bed-bugs may pass on certain disease germs from one person to another. Brushing all possible breeding places with coconut oil, kerosene oil emulsions, plain kerosene or creosote is effective. A small syringe or a fountain pen filler may be used to squirt the kerosene right into their holes. Very hot water will also destroy bed-bugs and their eggs. If a room is badly infected, sulphur may be burnt in it as a disinfectant, after closing every crevice through which air can enter. Sun-dry all bedsteads, clothes and hangings at least once a week.

If one lives in a bug-infected neighbourhood, it is difficult to keep bed-bugs out of one's house. If you find that they come from the neighbour's house through your windows or any other entrance, wash the framework of your windows daily with kerosene oil.

(*d*) *Fleas*. There are many varieties of fleas (Figure 49). The human flea, the dog flea and its close relative the cat flea, the chicken flea and the rat flea are of special concern to us since they transmit diseases from animal to man and from man to man. Thus these harmful insects live on different kinds of animals and cause diseases to man.

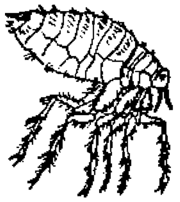


FIG. 49. Flea (*Greatly enlarged*)

The dog flea causes a great deal of annoyance to pet animals. The chicken flea seriously afflicts poultry. The rat flea which leaves the body of a rat or squirrel that has died of plague has been proved to be the greatest and probably the only cause of the spread of bubonic plague.

The breeding place of fleas is generally rubbish on the ground or cracks on the floor. Therefore you must keep the house and its surroundings thoroughly clean. Fill up all cracks in floors and walls. Tiled and wooden floors and walls should be washed well with a solution of kerosene oil emulsion. The earthen floor or the surroundings of the house, if affected, may be heavily sprinkled with common salt, and then dampened with water. Lime may also be scattered around. This method of cleaning must be repeated successively for two or three days. Chickens may be treated in the same way, but do not let chickens eat the salt. To get rid of living fleas from animals, wash them in a solution of kerosene oil emulsion or powder them with patent powders according to directions. Where infected, rub chickens with kerosene oil mixed with grease.

If a grass lawn is infested with fleas, cut the grass very short. Then the sun will kill the vermin as they hatch. Where bedding is infected, or in danger of being infected, spread it out daily on stone or sand under a hot sun. Direct sunlight kills fleas in one hour. But a perfectly clean room will quickly become infected again if stray visitants can find suitable breeding places and if the floor is not kept scrupulously clean. Therefore look for and destroy immediately stray insects, whenever there are signs of their existence.

INSECTS WHICH HARM US BY INFECTING FOOD

(*a*) *House-flies*. The house-fly (Figure 50) is our greatest enemy. It breeds in filth, body wastes of man and animals and damp house refuse. It spreads diseases by depositing micro-organisms on our food causing intestinal diseases, after gathering them from body wastes from which it has alighted.

The house-fly lays its eggs in clumps on the surface of manure, preferring horse manure to others. In the absence of manure, it lays eggs on any organic material, animal or vegetable. A single fly will lay as much as a hundred eggs at a time. Each egg is about one-fifth of a centimetre long. These eggs hatch out in twenty-four hours or sometimes less, according to the amount of the surrounding moisture and temperature. The creatures that emerge from the eggs are called *maggots* or *larvae*. They feed on the manure on which they were bred, and, under favourable conditions, attain their full size in four or five days. Before they are fully grown they burrow into the ground and adopt the form of the *pupa* or *chrysalis* in which they remain from three to ten days. In cold countries they may remain in this state throughout the cold winter season. From the pupa, the perfect insect emerges. After three or four days, the female is ready to lay eggs. Thus, under favourable conditions, such as a tropical climate, a female house-fly lays a hundred eggs within twelve days of its existence. This accounts for the enormous number of house-flies that appear during the hot and monsoon seasons.

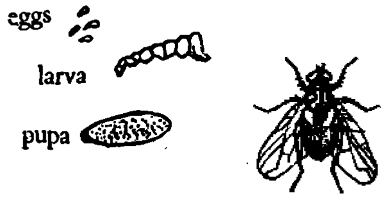


FIG. 50. Life cycle of the fly

As the fly crawls over body wastes or as the female fly rises after laying eggs, it carries away filth and disease germs on the minute hairs with which its legs are covered. When it settles again on food, sugar, cut fruit and sweets, which are its favourite items, it leaves on them micro-organisms which it carries. These germs enter the mouth and stomach of a person who eats this contaminated food. The micro-organisms of diseases, such as cholera, typhoid, dysentery and even tuberculosis, are thus introduced into the human body. Therefore, disinfect and destroy all possible breeding places of flies. Cover all refuse pails and destroy the eggs of flies with kerosene, borax or chloride of lime.

If, in spite of all the care taken, flies abound in your neighbourhood, screen all windows and doors with netting

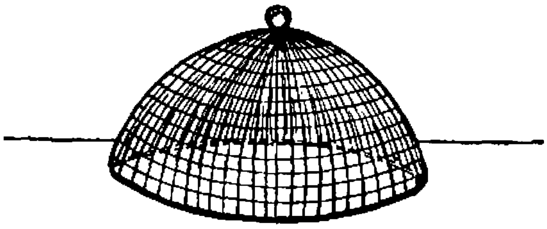


FIG. 51. Meshed cover for food

especially those of the store room, kitchen and dining room or otherwise use wire-meshed covers (Figure 51) for food. Maintain cleanliness in the house. Keep the kitchen dry and always cover food.

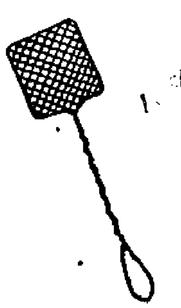


FIG. 52. Fly-flap

~~You can also~~ use fly-flaps (Figure 52). A fly-flap usually consists of a handle to which is attached a piece of flexible wire netting. Sticky fly-paper and fly-traps (Figure 53) are also helpful in eradicating flies. A fly-trap usually consists of a cone made of wire netting, set in a cylinder made of the same material and baited with scented sugar. The flies can enter easily from beneath, but seldom find their way out. When the flies are caught, the trap may be plunged into boiling water to kill the flies at once. A little poison, as recommended by your chemist, may be added to water sweetened with scented sugar and exposed in saucers. But poison is always dangerous when children and pet animals are around.

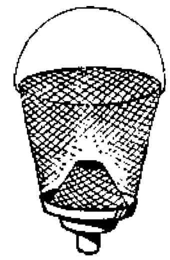


FIG. 53. Fly-trap

It is the duty of the municipality or other departments of local administration to see that the breeding places of flies are not allowed to exist uncovered. If laws are strictly enforced, flies can be quickly eradicated.

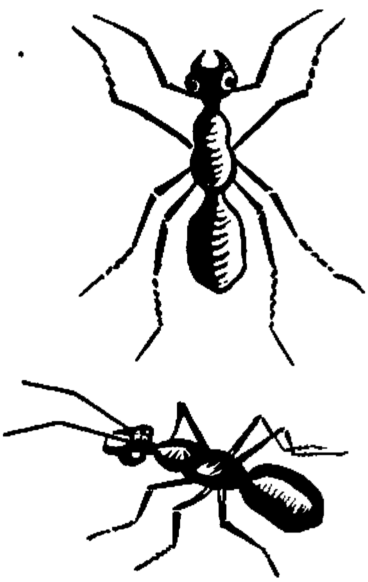


FIG. 54. Ant

(*b*) *Ants*. The ant (Figure 54) is a busy little scavenger. It is a means by which dirt and dead creatures are removed. Probably it does more good than harm in our homes. But ants may leave germs also. They generally spoil food by crawling over it. Therefore keep the legs of food safes standing in small containers of water with a little oil on top. If ants come in large numbers, sprinkle borax plentifully around their haunts.

(*c*) *Cockroaches.* The cockroach (Figure 55), like the fly, carries disease micro-organisms on its legs and walks over food. They attack not only food supplies to which they have access but also damage cloth and leather bindings of books by eating the starch paste used in binding. Several varieties of cockroaches haunt our houses. Some varieties devour the surfaces of leather itself, whether it be of shoes, suit-cases or books.

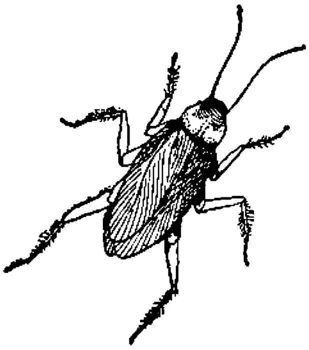


FIG. 55. Cockroach
(*Life size*)

The remedy for this is scrupulous cleanliness. The removal of even the tiniest particle of food and the use of some repellent, such as borax, pyrethrum or sulphur, along the passages behind rows of books or shelves and the frequent spraying of insecticides around the haunts of these insects will help to eradicate them.

If a particular room is infested with cockroaches it should be tightly closed from all corners and pyrethrum powder burnt inside. The insects become stupefied and can be swept away and destroyed.

INSECTS WHICH DAMAGE OUR PROPERTY

(*a*) *Silver Fish.* Silver fish (Figure 56) devour artificial silk and starched clothes, paper and paste. It gets its name both from its appearance and from its smooth, gliding movements. It causes great destruction to anything that contains starch, paste or size and greedily eats artificial silk (rayon). It attacks the surface of sized paper, the paste used in binding books or framing pictures, starched clothes, and silks if they are stiffened with size.

FIG. 56. Silver fish (*Life size*)

Silver fish usually cause damage only when their food has been left undisturbed for some time in chests or cupboards. The best precaution against silver fish is to turn out and clean all such places frequently. Fresh pyrethrum powder dusted along their haunts and sulphur or pyrethrum fumes will keep them away.

(*b*) *Book-lice*. These tiny creatures (Figure 57) may be seen inside books when they are opened suddenly. They devour the paste used in binding books and framing pictures, and get into mattresses or upholstered furniture. They are present only when houses or cupboards are left shut for some time. All rooms should be aired well every day. Book cupboards must be turned out and dusted frequently. If these little pests are found in large numbers, the room should be heated to 55°C for several hours or have sulphur burnt in it.

FIG. 57. Book-louse

(*c*) *The Clothes Moth.* The larvae of this insignificant little insect (Figure 58) are found in two or three varieties. They cause great destruction to woollen clothing which are put away during the hot weather. The moth itself is harmless, but lays its eggs on wool which is devoured by the larvae as soon as they develop. The larvae of one variety makes for itself a little case, in which it may sometimes be seen climbing up a wall to seek a crevice in which it can pass its chrysalis stage. Others spin a little silky case and remain in the cupboard or box in which they have been hatched until they are fully grown. The best way to keep clothes, furs, woollen rugs and other such belongings free from moths is to shake them frequently in the open air and sunlight. Where this cannot be done, they should be stored in air-tight, tin-lined boxes after being wrapped well in old newspapers, the ink of which is particularly repulsive to moths.

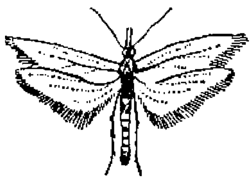


FIG. 58. Clothes moth (*Life size*)

Putting clothes away in ordinary drawers and cupboards with camphor and naphtha balls does not always keep away moths. Although moths do not like the smell of camphor and naphtha, they can still lay their eggs on garments surrounding them, if no other suitable place can be found; and as soon as the egg is laid the damage has been done. If you only have an ordinary chest-of-drawers wrap your clothes in newspaper and again in heavy tarred brown paper. Spray your / cupboards and chests with kerosene oil emulsion or any other patent insecticide such as DDT or petrol, whichever being available in the market.

(*d*) *Crickets*. The cricket (Figure 59) does much damage to wood by eating and boring holes into it. Apply the same methods as you would when eradicating cockroaches.

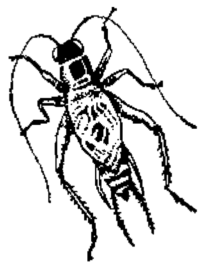


FIG. 59. Cricket (*Life size*)

(*e*) *Wasps.* The wasp (Figure 60) is an occasional visitant which has an unpleasant sting. Some types of wasps damage the woodwork of houses by boring holes in which they deposit their eggs. They must be watched during their breeding season and driven out at their first appearance. Sometimes they come in swarms. A dense smoke of neem leaves will drive them away if all the windows are left open.

FIG. 60. Indian wasp (*Life size*)

(*f*) *White Ants.* White ants (Figure 61) cannot be classified as ants, although they live in colonies like other ants. They feed on wood. The little earthen galleries they make above the surface of the ground, on trees or on wooden pillars can cause great damage. They destroy wood by eating away the centres of pillars till only the outer shell remains and the pillar collapses. They form galleries on stone or concrete surfaces also in order to reach wood. These galleries are made from body wastes mixed with earth.

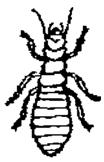


FIG. 61. White ant (termite)

After emerging from the egg, the insect passes through two stages: the immature and the mature forms. There are three varieties in the mature form; (1) the soft-bodied wingless workers who do the damage; (2) those called 'soldiers'; and (3) the winged sexed variety, which can be seen in swarms in certain seasons of the year, and which shed their wings and set out to establish new colonies. The workers cannot live in the light and cannot lengthen their galleries without moisture. Therefore they need communication with the ground. If this communication is cut off by destroying their galleries near the ground, all those above and along the same line will dry up and perish. If left undisturbed, they will travel even to the third storey of a house, or to the top of a high tree.

Constant vigilance is necessary in order to prevent white ants from destroying our houses. The housewife must wage constant war against these insects specially when the neighbours are not clean or particular about keeping their homes free of these pests. As soon as the little galleries appear, they should be destroyed. Kerosene should be poured into the hole or crack from which they had appeared and the crack itself should be filled with cement.

Timber for buildings should always be laid on rock or dry cement. If they are to be set on the earth they should be first impregnated with creosote. When plants are attacked by white ants they may be sprayed with kerosene oil emulsion.

THE PREVENTION OF HOUSEHOLD INSECT PESTS

The main precautions against all insect pests are :

1. Keep the house and surroundings clean and dry.
2. If there is any open water near the house, keep it clean and the edges of the drainage trim. If there is a large area of water, breed larvae-devouring fish in it. If it is only a small pool, spray the surface with kerosene once a week.
3. Do away with all broken vessels, old tins, bottles and such articles. They only collect water.
4. Keep stables, cowsheds, poultry runs and all out-houses clean and sanitary.
5. Fill up all cracks and holes in the walls, floors and ceilings of your house.
6. Lime-wash frequently.

7. Inspect bedsteads and other furniture frequently, and any dark corners or cupboards in the house.

8. See that all body wastes and house refuse are disposed of speedily and properly. Always keep a lid on your refuse pail, drum or pit.

9. Screen, with wire netting or mosquito nets, doors and windows so that insects do not enter your house.

10. Always keep food covered.

11. Grow healthy, scented trees and shrubs in your garden, such as eucalyptus, neem, tobacco and tulsi plants.

12. Use *repellents* which are substances emanating odours or fumes which are unpleasant to insects. For example, smoke from burning neem leaves, tobacco leaves or from incense drives away insects. Tied-up bunches of dried tobacco leaves and neem leaves also keep them away. Strong-smelling wood, such as pine chips, camphor or cedar wood, balls of camphor or naphtha, oil such as eucalyptus or citronella, and powders such as pyrethrum, sulphur, borax, soap, pepper or alum, scattered or sprinkled around the haunts of insects will help to keep them away. A good repellent may be made by mixing:

Two parts of citronella oil.
Two parts of camphor spirit.
One part of cedar oil.

Put a few drops on a cloth and apply.

13. Use *insecticides* which are substances that destroy insects. The best are pesterine (crude petroleum), petrol, kerosene oil and kerosene oil emulsion. Creosote is an oily substance extracted from coal tar, sulphur gas and formaldehyde gas. DDT preparations such as Neocid and Gammaxene and liquids such as Flit are available in any market.

Kerosene oil emulsion can be prepared as follows:

Three parts of soap
Fifteen parts of hot water
Eighty-two parts of Kerosene.

Dissolve the soap in hot water, warm the kerosene away from the fire by standing a bottle of kerosene in an utensil of hot water. Add the hot, soapy water gradually to the warmed kerosene. Bottle it and, when required, use as a spray or a wash after diluting it by mixing one part of the emulsion to twenty parts or less of water. This emulsion is very cheap and effective.

Use a sprayer charged with a good repellent or insecticide once a week in cupboards, and daily in dark corners.

HOUSEHOLD PESTS—RODENTS AND OTHERS

Rodents. Rodents are animals which gnaw their food with their front teeth. Rats, squirrels, beavers and porcupines belong to this category. They eat our food and make it unhygienic. So it is always better to make sure that they do not inhabit the areas near our homes.

Rodents and other pests which infect our households are rats, mice, lizards, spiders, scorpions, centipedes, toads and snakes.

Rats and Mice. Rats and mice (Figure 62) are to be

FIG. 62. Rat (LEFT) and mouse (RIGHT)

feared, not only because they have a dangerous bite, but, still worse, because they may introduce the dreaded plague flea into the house. They come in search of scraps of food and such items such as soap and candles, which they devour due to the fat they contain. If all food, especially grain and other stored household supplies, are kept in closed tins, and if the whole house is swept and kept clean, rats and mice will not come to trouble us. If they come in from a neighbour's house, a good cat or dog should be kept. Dogs are often good rat-hunters but rats and mice seem to have more fear of cats. Rat-traps are useful but these little creatures often instinctively know that they should avoid them.

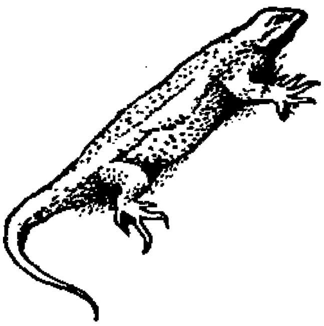


FIG. 63. Lizard

Lizards. The lizard (Figure 63) is a constant inhabitant of our homes. It is harmless and on the whole does good by destroying large numbers of harmful insects. But it leaves behind a lot of dirt. Its presence in the house means that it is able to find food there.

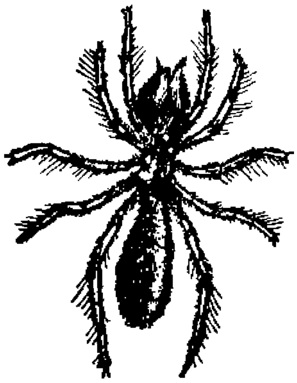


FIG. 64. Tarantula
(*Half life size*)

The Large Spider. The large spider, including the tarantula (Figure 64), is a large handsome and very poisonous spider. Large spiders have dangerous and poisonous bites.

FIG. 65. Scorpion
(*Half life size*)

Scorpions. The scorpion (Figure 65) has a poisonous bite and is dangerous. To avoid scorpions, the presence of other insects should be avoided first.

Centipedes. Centipedes (Figure 66) have poisonous bites and are very dangerous. By avoiding dirt in nooks and crevices one can discourage their presence in the home.

FIG. 66. Centipede
(*Half natural size*)

Toads (Figure 67). Besides being sources of dirt, they are sources of danger because they attract snakes.

FIG. 67. Toad

Toads also come in search of insects which they eat. Snakes favour toads as food and follow them into the house.

Snakes. Snakes (Figure 68) are found in desolate places. If they haunt the compound, do away with all grass and shrubs close to the house, and keep at least five metres of clean gravel all round. You may also keep a mongoose or a cat, and sprinkle the surroundings of the house with a strong decoction made of country tobacco leaves and water. Snakes hate the odour of phenyl and sprinkling it in openings and crevices will keep them away.

There are many poisonous snakes—vipers, kraits, cobras and many others. You should know how to handle a patient in the event of a snake bite.

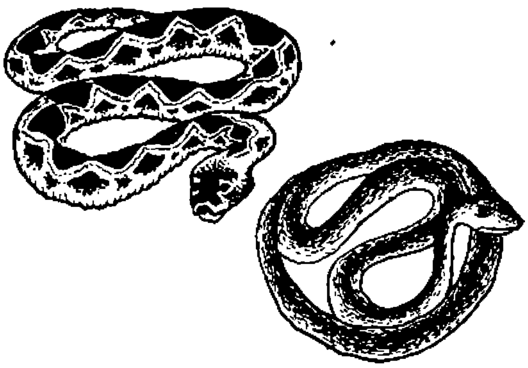


FIG. 68. Russell's viper (LEFT) and rat snake (RIGHT)

ASSIGNMENTS

1. With the teacher's help, burn in the open a small quantity of sulphur.
2. Prepare formaldehyde as described.
3. Make kerosene oil emulsion and apply it to eradicate household insect pests.
4. Make a fly-trap.
5. Prepare tobacco water and apply it to eradicate household insect pests.
6. Breed some mosquitoes (culex) and observe the different stages in their development.
7. Explain the following terms: repellent, insecticide, deodorant, fumigant.
8. Make a list of the household pests you have seen, arranging them according to the danger they cause to human beings.

9. What special advantages come from using a sprayer?

10. Draw the many stages an insect passes through from the egg.

11. Explain clearly how the house-fly and the mosquito cause disease.

12. Visit a museum and see the toads, scorpions and centipedes.

13. Learn the treatment that can be given to the bites of scorpions and centipedes.

CHAPTER XV

CAUSES OF DISEASE: THE ROLE OF MICRO-ORGANISMS

THE habits formed from childhood with respect to food, clothing, shelter, cleanliness, sleep, exercise and rest are the factors which influence the growth and health of our bodies, our resistance to disease and the length of time we are to live—which is known as the 'life span'. A plough or an engine wears out quickly if it is neglected; but it will last for many years if given proper care. Similarly human bodies, which are like engines, may last for many years if care is given, or may be destroyed prematurely by diseases caused by the deficiency of nutrients, or germs carried through impure milk, food, water, bites and inhalation.

THE CAUSES OF DISEASE

Around us there are many enemies to our health. We should know them and their habits in order to protect ourselves from them. A French scientist, Louis Pasteur, was so deeply concerned about the loss of human life and of working efficiency as the result of disease that he devoted his life to the study of the causes of disease. He found these causes largely due to a hitherto unknown world of micro-organisms; unknown because they were so small that they could not be seen by the normal eye except under a high-powered microscope.

These tiny living micro-organisms are so small that they are called *microbes* or *germs*. They are so small that they

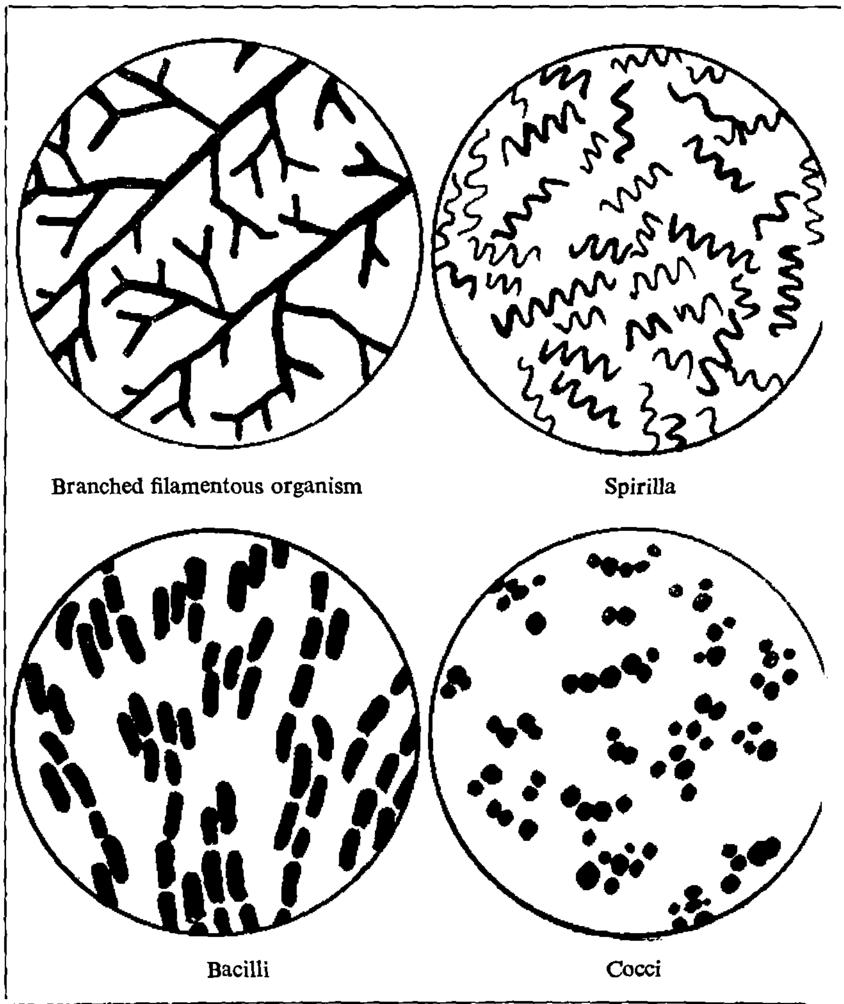


FIG. 69. Types of bacteria

cannot be removed by ordinary sweeping and dusting, even when it is done carefully.

Micro-organisms, bacteria (Figure 69) or germs are to be found nearly everywhere on the surface of the earth, in air, water and food. They are present in large numbers in our mouths, stomachs and intestines. Micro-organisms are brought into our houses through insects, food, water or milk. Sometimes they are found lurking in our compounds or on the floors or in the corners of our rooms or clinging to walls. Some are found floating in the air. They thrive in the living body, whether it be of an insect, animal or human being, but when removed from the body by being coughed out, peeled off the skin, or expelled along with body wastes, they tend to dry up and die in a few days, although some such as those of enteric fever and tuberculosis may live for a longer period. As long as they are in a semi-dried state, they can be revived with a little moisture and favourable conditions and spread disease. They perish quickly under the influence of direct sunlight, oxygen, in open dry earth and in rapidly-flowing water. They remain in houses and sheds under cover, in undisturbed rubbish heaps, in damp earth and in stagnant or slowly-moving water. Thus they float around and cause disease. One can see bacteria removed from the surface of healthy teeth under a high-powered microscope.

Like other 'robbers', harmful micro-organisms 'love darkness better than light because their deeds are evil'. They hide in dirt and unclean conditions. They remain wherever they have fallen if the place is moist. If they fall on dry soil, they will be wafted about by every breeze, riding upon dust particles as on airships. If one keeps one's mouth open, micro-organisms fly into it and thrive in the dark, damp and warm atmosphere, where food is found between the teeth. When micro-organisms enter our bodies through water, food, air and bodily contact, they cause dreadful diseases such as plague, cholera, influenza, enteric fever, malaria, pneumonia, tuberculosis and smallpox.

However, all bacteria are not harmful. Some micro-organisms are our friends; but we need to distinguish between the friends and the foes.

The first group of friends is called *yeast* which help to ferment batter for *iddli*. They are important in raising dough for bread. Some bacteria help to change milk into curd and are useful in the manufacture of vinegar. They are also the means of introducing nitrogen in the soil and making it more fertile for farming. Some bacteria break up waste matter which is thrown on the earth and help to purify sewage.

EXPERIMENT 1. *How yeast grows.*

With a pipette remove a drop of sediment from growing yeast prepared by fermentation. Place the drop on a slide, cover with a cover glass and study under a microscope.

Remove some of the yeast found floating on the surface and study in the same way. Note that the yeast cells are in groups. Make a sketch of several groups, showing buds of various sizes.

Even *moulds* which cause our books, shoes and food to be spoiled in the monsoon are sometimes friends, as they help to produce appetizing flavours in cheese and tea.

Pasteur first observed how germs fermented to produce the green mould on stale bread. One hundred years later, this mould was used to prepare antibiotics by Sir Alexander

Fleming, who cultivated the mould, *Penicillium notatum*, from which the antibiotic penicillin is prepared.

EXPERIMENT 2. *Moulds on different food.*

In separate dishes, place bits of bread, some pieces of lemon and a bit of banana. Cover and set aside. Protect them from evaporation and keep them moist.

Moulds will grow in a few days, but probably different species will form upon different materials. Compare the moulds and determine how many kinds can be seen.

EXPERIMENT 3. *Spores.*

After the moulds in the previous experiment have begun to produce *spores* as indicated by the appearance of some colour, remove a little spore material from the surface with a knife blade or a platinum wire and examine under a microscope. For this purpose, a compound microscope is necessary since the spores are very small (Figure 70).

A few varieties, of which tetanus is the most important example, are called spore-bearers A spore is a tiny mass of living matter encased in a tough membrane which protects it from harm within the body of the parent germ. When conditions are favourable the membrane breaks and the tiny mass of living matter is set free to begin its life as a new germ. Spores are resistant to heat and drying to a remarkable extent. In order to be sure that they are all destroyed, they must be subjected to continuous boiling for at least twenty minutes, or to intermittent boiling.

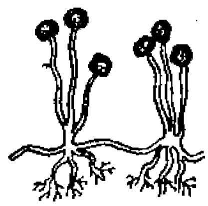


FIG. 70. Spores of bread mould (*greatly enlarged*)

EXPERIMENT 4. *Growth of mould from spores.*

Moisten a bit of bread and transfer, with a platinum wire, a little bit of the spore mass from a vigorously growing mould to the surface of the bread. Cover with a glass and set aside for growth. Examine every day and note that moulds start from where the bread was inoculated with the spore.

HARMFUL MICRO-ORGANISMS

There are large varieties of bacteria, yeasts and moulds which are harmful. When they get the opportunity, they cause disease. If we are to avoid disease, maintain health and increase our life span, we should know the habits of harmful micro-organisms. Knowledge of how to prevent these 'robbers of health' from entering our bodies and causing illness is important. One way of preventing the presence of harmful disease germs is to learn about the conditions which are favourable for their growth and avoid them. If those conditions are avoided, or conditions in which they cannot survive are created, they can be eradicated.

Two classes of micro-organisms are to be considered:

(1) Those called *saprophytes* which live on dead food. Saprophytes use the same kind of food for sustenance as we do—dead animal and vegetable food. In consuming this food they break up the chemical molecules, leaving fragments which are quite unlike the original substance, which are called the by-products of decomposition. Sometimes bacteria reduce solid food to an almost liquid state which produces an odour and a new taste. This process is known as *putrefaction* if it takes place where there is little oxygen, and *decay*, if it takes place where there is plenty of air.

(2) Those which exist within the living body of plants

and animals, including human beings, are known as *parasites*. Many of these parasitic organisms are capable of producing disease. They are therefore called *pathogenic* organisms. Others, however, have the power of living upon dead as well as upon living matter, so they belong to both classes.

EXPERIMENT 5. *Examining some bacteria under a microscope.*

Some germs are round and some oblong, others are spiral or rod-like in shape. Some are smooth and others have hair-like projections called *flagella* by which they are able to move rapidly through fluids.

Some micro-organisms are so small that you would have to put fifty thousand in a row to measure 2 cm. Even the larger ones are so small that it would take ten thousand to measure 2 cm. One would wonder how anything so small could harm us! The reason why we have to fight them so hard is because they multiply more rapidly than anything we can imagine. As they are so small, we do not realise their presence until after they have begun to damage our health.

How Bacteria Multiply. The method of reproduction in bacteria is extremely simple. They grow to full size and, by the method of fission, divide in the middle every half hour. If you calculate how many progeny one germ would have in twenty-four hours, by fission every half hour, you will have to use geometrical proportions to work out the figure. You will find that even in half that time, the germ would have had about seventeen million offspring. If in one day, a germ can produce millions or crores of other germs, what a great danger they will be if they happen to belong to the pathogenic class!

In order to achieve this rapid rate of growth, they must have conditions favourable in terms of food and other factors. They thrive in dark, damp and dirty places. We can therefore avoid or limit their activities by sweeping out all dust and rubbish daily and by admitting fresh air and sunlight into our rooms.

Temperature is another important factor. In the warm climate of India, germs multiply rapidly, spoiling food and causing epidemics. Cold may not actually kill them but will retard their growth.

However, micro-organisms do not like too hot a temperature. That is what is in favour of the Indian climate. The hot beneficent rays of the sun destroy many germs which are exposed to them. Most bacteria are readily destroyed by boiling.

Most pathogenic bacteria grow best at a temperature between 30°C and 40°C. Since the normal temperature of the human body is 28.8°C., germs find it suitable for their growth.

Pasteur discovered that temperature of about 68°C was sufficient to kill most bacteria. That is why heating to this temperature is called *Pasteurizing*. In our country, since Pasteurization is not common, it is better to heat liquids to boiling point for them to be really safe and scientifically clean.

EXPERIMENT 6. *The effect of temperature on bacteria.*

(*a*) Place bits of cooked rice with a little water in three test tubes. Put the first tube in an ice chest, the second in ordinary room temperature, and the third where the temperature is high. Notice the speed of fermentation.

(*b*) Prepare two test tubes of treacle (syrup) or *gur* and water and inoculate (introduce into) both with a drop of yeast. Plug with cotton. Place one test tube in water and boil for ten minutes, and then leave both test tubes side-by-side in a warm place for two days. Determine whether the boiling has been sufficient to kill the yeast.

EXPERIMENT 7. *The effect of boiling on bacteria.*

Take some milk and warm it gently to a temperature of 54°C. Divide into two test tubes, set one aside without further treatment, but bring the other to a brisk boil for a minute and set beside the first. After some hours, see if fermentation has occurred.

Germs must have moisture if they are to grow and multiply. Spores may keep alive for a long time under dry conditions, but bacteria cannot absorb food unless it is wet.

EXPERIMENT 8. *The effect of moisture on bacteria.*

Place a little of the following dry food in separate test tubes: dry beans or grain, corn meal, a piece of dry bread, wheat flour or *atta* flour, and biscuits. In another set of test tubes place the same materials moistened with water. Set all aside in a warm place for twelve to twenty-four hours and notice the effect of water in bringing about putrefaction.

EXPERIMENT 9. *The effect of drying on bacteria.*

Place a piece of bread in a naturally damp place or in a plate slightly moistened with water and another piece in a dry place. Leave for two or three days and notice the effect of drying in preventing the growth of moulds. The slice which remains dry has no moulds but the other is soon covered with them.

Most bacteria require *oxygen*, just as human beings do, to live and grow. That is why the decay of food often begins on the surface. However, some bacteria grow quite well without oxygen; currents of air retard their growth. The former are called *aerobic* and the latter *anaerobic* bacteria.

EXPERIMENT 10. *The effect of air currents on bacteria.*

After the bread in Experiment 9 shows a thick growth of mould, remove the glass and leave the bread exposed to air. The mould ceases to grow and flattens against the bread.

As our bodies secrete sweat and urea, micro-organisms also have certain secretions. Those of some bacteria are quite harmless, but others called *toxins* can be very poisonous.

HOW MICRO-ORGANISMS CAUSE DISEASE

Micro-organisms which cause disease sometimes go into all parts of the body. Often they allocate themselves to one part; but wherever they find a chance to grow inside, they multiply rapidly and are responsible for decomposition by their products and secretions. Some of these secretions and by-products are poisonous toxins. When toxins are absorbed into the blood, the body becomes poisoned. Sometimes bacteria do not enter the blood but grow in the throat, intestines or other organs, where they produce toxins which are absorbed into the blood. This is the case with cholera, where the germs grow in the intestines and secrete poison which is absorbed along with the food into the blood, and thus distributed all over the body. This is the same with practically all disease germs.

A small deep wound which does not bleed much is the most suitable place in which germs thrive best without air. In a wound that heals soon and in which bleeding is not continuous enough to wash them out, the germs of tetanus multiply rapidly and secrete a poison which stiffens a person's muscles and causes immobility of his jaws so that he cannot move them. This disease is therefore sometimes called *lockjaw*. Wounds acquired in stables, on roads or other places where horse manure or organic matter is found are particularly liable to be infected by tetanus germs; so also are wounds inflicted by splinters and old rusty nails. Consequently anyone who happens to have a deeply punctured wound should exercise extreme care to clean it thoroughly. Open the wound and put into it some disinfectant, such as carbolic acid or iodine solution, before tying it up with a clean cloth. An anti-tetanus injection must be taken immediately as a further precaution.

DISEASES TRANSMITTED BY INSECTS

A German scientist, Sir Ronald Ross, discovered in 1897 that malaria is a disease transmitted by the mosquito. When a mosquito bites someone who has malaria it sucks the parasites into its blood. These parasites can grow in the mosquito's body as well as in the human body. They pass through several changes, finally reaching the salivary glands near the mouth of the mosquito. When the mosquito, with its salivary glands full of malarial parasites, thrusts its proboscis through the skin of a healthy person, it leaves some of those parasites in his blood. There they start their life history all over again, and whoever is bitten by the malaria-infected mosquito will soon fall victim to chill and fever.

Malarial fever is the result of microscopic parasites (Figure 71) entering the blood corpuscles, where they grow and form a number of spore-like bodies which, when mature, are set free by the rupture of the blood corpuscles. At this stage the victim experiences ague or chill, typical of malaria. The cycle, which takes about forty-eight hours, is repeated; thus the chill is felt every other day. Another

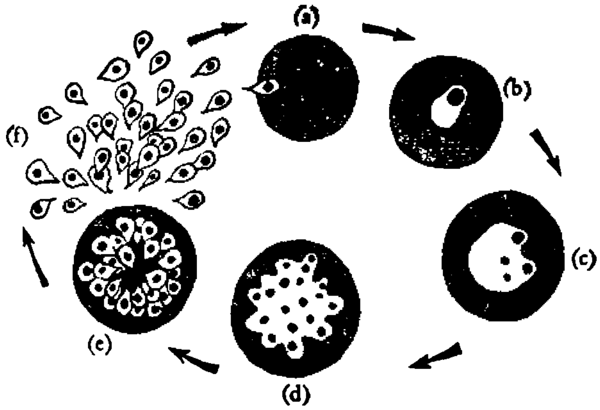


FIG. 71. Life cycle of malaria parasite. (*a*) Entering the cell; (*b*) Within the cell; (*c*) Development (*d* & *e*) Segmentation; (*f*) Red cell bursts, setting free young parasites

form of malaria occurs when the parasite takes three days to repeat its history and in that case the chills come every third day.

As the parasites never leave the body of the patient suffering from malaria, a way had to be found to destroy them. Fortunately it is now possible to kill them by taking quinine or a combination of quinine and atebrin. The best way of avoiding malaria is to sleep under a mosquito net at night because the mosquito which carries the malarial parasite bites only at night. We should also take the precaution of seeing that no old broken pieces of discarded vessels are left lying about in the compound in which rain water can collect and provide a good breeding place for mosquitoes. If you use ant tins for the food safe, empty them and refill them often with fresh water.

Dengue fever and filariasis (elephantiasis) are also transmitted by mosquitoes belonging to different groups, while sand-fly fever and one or two other short fevers are transmitted by the sand-fly. Plague is transmitted by the rat flea. A rat with plague will have crores of germs in a single drop of its blood. When rats die of plague, the fleas leave their dead bodies and seek food by biting human beings. Fleas contain plague germs in their bodies, owing to the fact that they have sucked the blood of the diseased rats. When they bite human beings, they regurgitate the germs of plague into the wound and thus people are infected with this deadly disease.

Plague germs are killed easily by exposure to direct sunlight. Therefore, airing rooms and beddings in our homes is very important. Furthermore, we must keep the house so tidy that there are no hiding places for rats. We must also keep grain and food protected from rats so that they will not be enticed indoors.

Assignments

1. Explain how yeasts. moulds and bacteria can be beneficial as well as harmful to man.
2. Under what conditions do micro-organisms flourish?
3. Explain clearly, with diagrams, the cycle of change that a malaria parasite undergoes.
4. Why is it so important that we should guard against the tetanus germ?
5. How can you protect yourself from malaria?

CHAPTER XVI

PREVENTION OF DISEASES: DISINFECTION

MICRO-ORGANISMS can be fought only with the weapon of perfect cleanliness aided by disinfectants. A *disinfectant* may be solid, powder, liquid or gas and one that will kill micro-organisms. It is sometimes called a germicide or sterilizer. The disinfectants in common use are our every-day friends—sunlight, heat, fresh air, ordinary household soap and freshly burnt lime. The house that is always well ventilated with plenty of light and air will not harbour germs. Sunlight which enters the house weakens germs. Germs will be killed if they are exposed to the direct rays of the sun. Alternatively they are killed by heating to boiling point for five minutes though micro-organisms causing tetanus require half an hour's boiling.

When an infectious disease occurs, it is good to disinfect all parts of the house by special means. Your doctor will advise you when there is need for special disinfection. In the case of epidemics of plague or cholera, the municipality must be requested to disinfect the house.

SPECIAL METHODS OF DISINFECTING THE HOUSE

1. *Exposure* of all articles to direct sunlight for a few hours.

2. In the case of textiles, *boil* for half an hour with soap and water. If the textiles are stained, soak them in cold water. Disinfect that water before throwing it away.

3. *Exposure to Steam*. This is very effective but requires a special apparatus.

4. *Burning Sulphur*. Close tightly every door, window and ventilator in the room and fill up all cracks. If the air in the room is dry, boil a pan of water in it till the air is quite steamy. Place a metal tray in the middle of the floor, and put on it a *sigri* containing a layer of red hot charcoal. For a room of 200 sq. metres place 2 kg. of pure sulphur on the charcoal, or place the sulphur in a pail, pouring in a little alcohol and setting it alight. As the fumes will affect your throat leave the room quickly closing the door tightly behind you. Leave everything undisturbed for sixteen hours.

Sulphur candles bought ready for burning are more convenient. Sulphur stains metal. Therefore remove, or cover with oil, metal objects in the room before disinfection.

5. *Exposure to Formaldehyde Gas*. For a room of 200 sq. metres 113.6g. of pure sulphur will be adequate. Close the room and dampen the air as indicated in method No. 4. Place $\frac{1}{4}$ kg. of crushed crystals of permanganate of potash in a pail in the middle of the floor and pour on it $\frac{1}{2}$ litre of formalin. Leave the room quickly and close the door, allowing it to remain closed for six hours. Immediately a gas is formed which rapidly fills the room. Do not try to use sulphur or formaldehyde gas except under the supervision of an experienced person. Disinfectants which produce fumes or gas are called *fumigants*.

6. *Use of Solutions*. A Scottish surgeon, Dr. Joseph Lister, used disinfectants to cut down deaths in childbirth and surgery. He sterilized his surgical instruments with disinfectants like carbolic acid, which saved the lives of many patients after operations. From that time, the use of carbolic acid solution as a disinfectant has become common. Solutions of carbolic acid, saponified cresol,

formalin or phenyle are useful disinfectants. They may be used with water for washing the floor and walls of rooms, for placing in sputum bowls or pans and for disinfecting drains and privies. Always read the directions given on the bottles before putting them to use. Remember that they are poisonous and if kept in the house, should be placed on a high shelf, out of the reach of children. New disinfectants appear in the market from time to time. Consult your doctor or an officer of sanitation before buying them. Many people think that permanganate of potash is a disinfectant. It hinders the growth of micro-organisms in wounds, but it cannot be relied upon to kill them. However, it can be used to purify water of all organic matter.

If the floor of a room is to be disinfected and if it is made of earth or earth mixed with cow-dung, dig up the surface, remove the material collected outside and burn it. If this is impossible, spread lime or quicklime over the floor or soak the floor with a strong disinfectant solution.

During an illness, do not allow others to use any article the patient has been in contact with without disinfecting it. Keep aside special dishes, vessels and spoons for the patient and wash them in his room or on a verandah outside. Wash and disinfect or sterilize by boiling sheets, clothes and other articles used by him. Body wastes should be disinfected by the use of the solutions mentioned above or by quicklime. Wash your hands in a disinfectant every time after touching the patient, his bed or any article used by him. Anything of little value, papers or magazines, in the sick room should be burnt as soon as they are done with.

If there is anyone in your house suffering from tuberculosis, remember that micro-organisms for the sputum of the patient will float in the air and deposit themselves on the walls of the house. The patient should spit in a little vessel lined with paper over which quicklime is spread. The paper with its contents can be removed and burnt or buried. The patient who may or may not be able to move about, needs plenty of fresh air, and if this air is given free passage through the room it helps to carry out germs. An open vessel containing a solution of a disinfectant such as izal helps to purify the air.

Liquid disinfectants which are not poisonous or injurious to human beings may be sprayed on walls, into corners and into the air itself, when there is an infectious illness in the house. Because of the compression pump, fine particles of liquid or oil vapour mixed with air come out of it when the piston works. Vapour of kerosene or other inflammable vapours mixed with air is highly explosive. Therefore never spray near an open fire, whether it be the kitchen fire or a lamp.

Common colds are very infectious and, when one member of the family has a cold, it generally spreads to the others. Disinfectants can check their spread. If a family gets into the habit of using a spray, that house will be kept free from diseases.

Micro-organisms brought in with water, milk or food, those found on the ground and those carried by insects also have to be tackled.

Micro-organisms which are brought in with milk may be those of tuberculosis, from a cow suffering from tuberculosis and those of intestinal diseases probably deposited in the milk by flies. The remedy is to boil milk as soon as it comes into the house and then to keep it covered. Fruit and vegetables that are eaten raw should be thoroughly washed. Cooked food should be bought only from reliable suppliers who have not exposed it for sale in uncovered vessels.

Micro-organisms which may be found in the ground are those of intestinal diseases—diarrhoea, dysentery, enteric fever and cholera. They are carried by flies. Other micro-organisms that come from the ground are those that cause hook-worm and tetanus or lockjaw. Hook-worm is contacted by picking up the minute hook-worms through cracks in the skin of the feet. This group of diseases can be controlled only by the proper disposal of body wastes and scrupulous cleanliness in privies and latrines. Different methods of disposing body wastes and the destruction of germs lurking in them will be studied in the next two chapters. The housekeeper's duty is to keep latrines and privies clean. A long-handled brush should be kept specially for the latrines which should be washed well daily with a strong solution of soap and water, and with a disinfectant once a week or more often. Ceilings and walls of latrines should be whitewashed once a month. In the case of an infectious disease in the house they should be disinfected every day. If latrines are kept thoroughly clean and disinfected regularly they will not attract flies.

Carefully distinguish disinfectants from deodorants and antiseptics. Deodorants simply hide unpleasant odours. They do not destroy micro-organisms. Generally, weak solutions of the different chemical disinfectants mentioned above serve as deodorants.

ANTISEPTICS

Dr. Lister reasoned that micro-organisms caused the septic conditions which frequently followed surgery. By operating under a spray of phenol solution and using antiseptic dressings for surgical wounds, he successfully reduced post-operative sepsis. Antiseptics hinder the development of microbes in wounds where, perhaps, stronger disinfectants might harm the patient. The best known antiseptics are boric powder, permanganate of potash and iodine.

Assignments

1. Observe micro-organisms under the microscope.
2. Define germicide, disinfectant, sterilizer.
3. How would you prevent the spread of cholera or of tuberculosis?
4. Enumerate the new disinfectants which are in the market.
5. Draw a chart to indicate the nature, symptoms, incubation and treatment for the infections caused through micro-organisms.

CHAPTER XVII

PREVENTION OF DISEASES: PROPHYLACTIC MEASURES

As the saying goes 'prevention is better than cure', it is imperative for all of us to take measures in order to prevent disease. The different measures that can be observed are discussed in this chapter.

INOCULATION

If either cholera or plague breaks out in your district, you should get yourself inoculated. Inoculation, like vaccination, is a means of procuring immunity from disease. A limited number of dead germs is injected into the body. These being dead cannot grow or multiply, but their presence in our body stimulates the blood to produce *antibodies* which protect us. if the living germs of that particular disease ever attack us.

On the other hand, an injection of serum is more often used to combat a disease that has already attacked us, such as, diphtheria or tetanus. The reason for this is that the serum already contains these antibodies because it has been prepared from an animal that had previously been made immune by a series of inoculations. The antibodies in the serum hold the disease in check until our bodies have time to manufacture enough antibodies of their own to overcome the disease.

ANTIBODIES AND THEIR ANTIGEN—REACTIONS

Antibodies are specific substances produced by an animal in response to the introduction of a foreign body called an *antigen*. Antibodies are produced by certain cells in an animal and then admitted into the blood stream. Serum containing antibodies is known as an *immune serum* or an *antiserum*. An immune serum is capable of reacting with the homologous antigen either *vivo* (in the body) or *vitro* (outside).

It has been generally accepted that the formation of antibodies is carried on mainly in the reticuloendothelial system.

The presence of antibodies in an immune serum may be demonstrated in a number of ways, depending upon the type of the antigen. By such tests five apparently different kinds of antibodies may be recognized—antitoxins, agglutinins, precipitins, lysine and opsonins.

IMMUNITY

The fact that bacteria enter the body through the mouth, the nasal passages or a break in the skin does not mean that an infection will take place. The animal body has the power to prevent the growth and development of organisms even when they have gained entrance. This is known as *resistance*. Various defence mechanisms come into play and in most cases quickly remove the invading bacteria. Sometimes the resistance to a disease is characteristic of a species. It is then spoken of as *Immunity*.

There are two main types of immunity—*natural immunity* and *acquired immunity*. Natural immunity includes the species immunity, the racial immunity and individual immunity. Acquired immunity includes accidental and artificial immunity.

VACCINATION

Through many years' observation it has become evident that *if* a person had even a light attack of some disease, and recovered, he was not likely to get that disease again, at least for some time. It was a custom years ago for people to have smallpox given to them deliberately by a physician and they were then said to be *immune if* they recovered. An Englishman, Edward Jenner, whose name we should always remember and honour, learned that the girls who looked after cattle had a saying that anyone who caught cowpox would not be subject to smallpox. He began his experiments upon their statement in 1798 and found that by giving people cowpox (vaccinia) he could prevent their catching the deadly disease of smallpox. Vaccination thus confers immunity from subsequent attacks of smallpox in the same way that an attack of smallpox does to a patient.

Vaccination is the process and means of giving healthy people a very slight infection of cowpox. The term vaccination means the introduction of vaccinia into the human system. This vaccinia or cowpox is an allied disease given to prevent smallpox. Instead of a general eruption all over the body, vesicles appear only at the point of inoculation. Vaccination introduces vaccine virus under antiseptic conditions into the skin and is usually given on the outer side of the arm near the insertion of the deltoid muscle.

Vaccination can be done in one of the following ways:* the scratch method; acupuncture method and multiple pressure method.

The most common is the scratch method in which the skin is first cleaned thoroughly with soap and water and then rubbed dry. The clean skin is next scratched with a knife or lancet which has been boiled or passed through a flame. The germs of cowpox are smeared over the scratched surface and their presence there stimulates the production of antibodies which protect the vaccinated person from smallpox for about seven months. This protection is called immunity. Smallpox can almost entirely be prevented by vaccination.

In 1882, Dr Robert Koch discovered the tubercle bacillus, the germ that causes tuberculosis. The developed tuberculin provided matter which could be used to test the presence of the disease.

BCG Vaccine. Immunity to tuberculosis is now provided through the BCG vaccine. This name comes from the initials of the word *Bacillus* and the names of two French bacteriologists, *Calmette* and *Guerin*, who discovered it.

ELEVEN RULES FOR MAINTAINING HEALTH

1. *Rest.* Rest the mind and body by keeping calm, overcoming fear and worry. A change of occupation is also rest. Rest is necessary for the mind and muscles after work, and for their development. After work, muscles must have time to get rid of waste matter in their fibres and to take in food and build up cell fibres. If a muscle works too hard and does not have time for rest, it will become weak.
2. *Exercise.* Spend as much time as possible out of doors, walking and playing games. Hold the body in a correct posture, whether standing, walking or sitting.
3. *Air.* Breathe pure, clean air by keeping your windows open.
4. *Sunshine.* Let the sun shine on your body for a short time daily, but avoid over-exposure.

5. *Water*. Drink at least a litre and a half of clean, boiled water daily.

6. *Bath and Personal Grooming*. Bathe each morning and wash your hair at least every week. Clean your nails regularly and wash your hands before eating.

7. *Food*. Eat good food at regular meal times. Three meals a day are adequate.

8. *Teeth*. Brush the teeth twice every day—once on rising in the morning and again before going to bed at night. Use salt or a good paste. Eating a piece of fruit after a meal will also help to clean the teeth.

9. *Bowels*. Be sure that the bowels move at least once a day.

10. *Study*. Keep your mind on intelligent thoughts. Learn to concentrate when you study so as to learn new things, and not just to pass examinations.

11. *Sleep*. Sleep at least for eight hours with the windows open. Go to bed at regular hours. Do not cover your head while sleeping. Keep mosquitoes away by screening the windows and doors, or by having a mosquito net over the bed. Learn to relax.

Assignments

1. What is BCG vaccine? Explain the importance of vaccination.
2. Evaluate yourself to see how far you are observing the general rules of maintaining health.

CHAPTER XVIII

DISPOSAL OF WASTE MATTER AND SANITATION

Equipment required: A spirit lamp or a gas flame, glass piping, models of flush cisterns, traps and sanitary dustbins and small drain pipes.

THE waste matter of the household may be divided into three categories: (1) body waste; (2) water waste and (3) household waste. On the prompt and proper disposal of these wastes depends largely the health of the household.

We have already seen that, besides being unhealthy, unsightly, fetid and depressing, accumulations of waste matter, water and rubbish encourage micro-organisms to grow and increase. Disease in turn invites the breeding of our deadly enemies, the fly and the mosquito.

DISPOSAL OF BODY WASTES (HUMAN EXCRETA)

The body daily excretes plenty of waste matter. Hygiene teaches us the importance of forming regular habits for excretion. In order to keep our houses and their surroundings healthy and pretty, it is necessary to understand the principles of sanitation and the methods of disposal of wastes. The following systems are suggested for the disposal of excreta.

The Water Carriage System. The best way of disposing body wastes is by a system called the water carriage system in which the waste matter is carried away by water. In this system a set of water pipes supply water to privies and latrines and another set of drainage pipes (called sewers), running from each privy or latrine, take the waste water to the house sewer, which empties itself into the street sewer. This in turn drains into the main sewer which carries sewage, that is body wastes, to its final destination be it a sea, river or dumping ground. If this system is to work well, sewers should be laid on a gentle slope. If sewage is to be emptied into the sea, the pipe must run a long way out under the water. Sewage drained into the sea is sometimes sterilized.

Depositing sewage into rivers is strictly forbidden in most countries as the water into which the sewage passes becomes contaminated and is thus dangerous to health. Sewage may be dumped on land either as it is or after being strained or treated with chemicals. The best way is when it runs into small jointed pipes within a foot of the surface over a wide area of land. Bacteria in the ground purify the sewage and what is left enriches the soil. These bacteria live in great numbers within a foot of the surface of the earth. The whole process of sewage disposal requires careful and scientific management.

A water carriage system, such as the one described

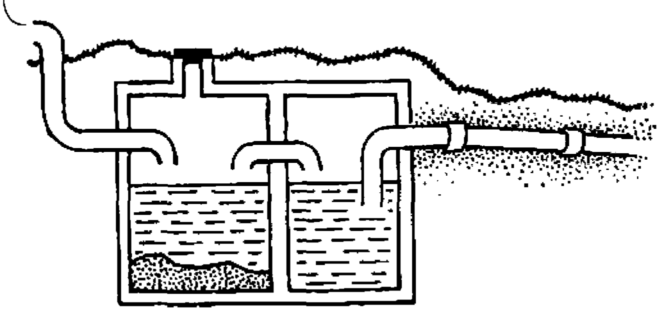


FIG. 72. Septic tank.

above, is always managed by a public body of men for a whole city, municipality or town. However, where there is no such underground drainage system, water in the house may be used with a simple arrangement of pipes on a smaller scale to carry sewage into what is called a *septic tank*. A septic tank is a large underground non-porous tank or cistern (Figure 72). It has been found that if sewage is carried into such a tank away from light and air, certain micro-organisms or bacteria which do not require air will change the greater part of the body wastes into a clear liquid which may be carried across the land, preferably in the way just described. The solid part which forms very slowly sinks and accumulates at the bottom of the tank. It may be periodically removed and used as manure for the soil.

The liquid which passes or is pumped out from a properly constructed septic tank is clear and free from smell. But this does not mean that it is free from harmful germs. If it is to be passed into a stream it must first be sterilized by using certain chemical germicides. Water may also be used to carry sewage into a *cesspool* which is simply a deep hole dug in the ground (Figure 73). It was originally lined with stones through which the liquid portion leached, that is, soaked into the ground. Later

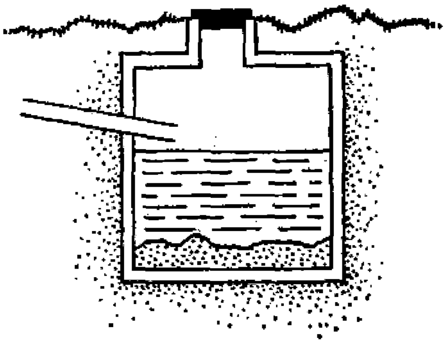


FIG. 73. Cesspool

varieties were made watertight without outlet pipes and without any connection to a drainage system. Since they are exposed to open air, cesspools are dangerous to health and should be discouraged.

Septic Tanks. A septic tank may be large or small. A large house and estate may have its own or there may be one for a small group of houses in a town or village. This system may be employed wherever the water supply is sufficient, and where a public municipal water carriage system is not possible. It has been found that wherever a scientific water carriage system is in use, diseases such as cholera and enteric fever tend to disappear.

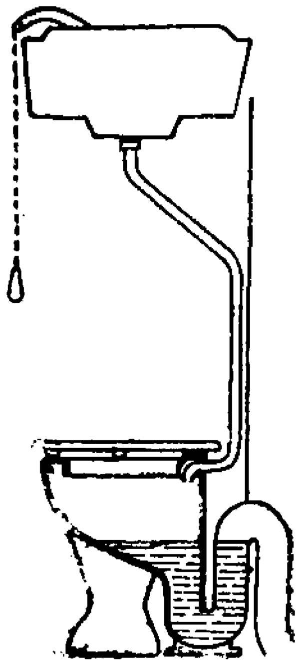


FIG. 74. Water closet

Water Closets. For any form of the water carriage system to be effective water in the latrine, usually called a water closet, must descend with a certain amount of force to flush the waste matter. This means that there must be a cistern above the level of the closet (Figure 74).

Water closets should, if possible, be situated in a little out-wing of the house and should be well ventilated. If there are closets on different floors they should be arranged vertically, that is one over the other, so that the drainage can run in a vertical line to facilitate free flow. The floors of bathrooms should be of marble, tile, cement, stone or any washable slabs. The walls of bathrooms should also be made of similar materials or painted with oil-paint. Closets should be furnished with a pan or bowl set into the ground or arranged with a seat, a flushing cistern and a drain pipe for carrying away the water and waste matter. Pipes should be visible, easily reached and passed out of doors. The cistern should not be less than 1.5 metres above the level of the pan. The shape of the drain (Figure 75) is like the letter 'S'. It is known as the 'S' trap.

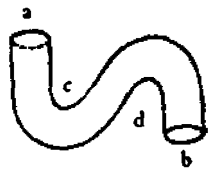


FIG. 75. S-trap

EXPERIMENT 1. *To show the use of the S-trap.*

Take a piece of glass tubing, bend it over a flame into the shape of a horizontal 'S'. Call the upper pipe *a* and the lower *b*; one bend *c* and the other *d*. Now pour a little water coloured with ink into *a* and pour on top of it some pure water. The latter will replace the coloured water in *c* and drive it into *d* and *b* while some of the pure water will remain in the bend as in Figure 76. Now if you look again at the trap in Figure 75 you will see that the same thing happens with sewage.

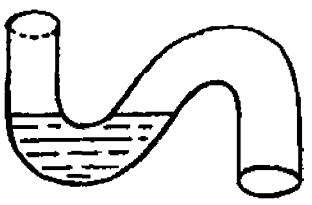


FIG. 76. S-bend with water seal

The water remaining in the bend is called a water seal and prevents the rise of any odour or gas through the pipe into the bowl. What does the name *water seal* imply? It means that water seals the back-flow of odour into the bowl and room. There are other forms of traps that act as water seals besides the S-trap. But the principle of the water seal is the same.

The flushing cistern (Figure 77) is provided with a handle which is pulled when a flush of water is needed. The drain pipe usually passes through a wall out of the house and enters the ground and then into the house sewer. The way

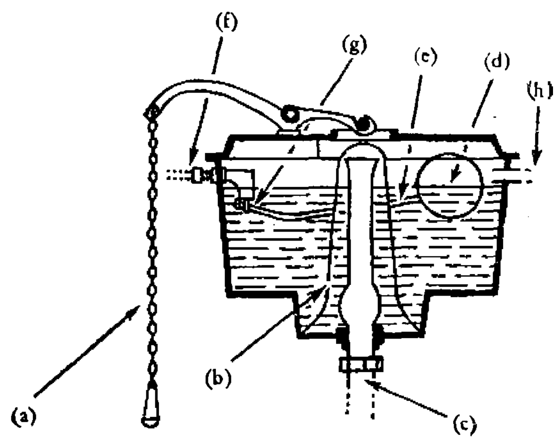


FIG. 77. Cistern

in which the flushing water enters and leaves the little cistern can easily be seen. Imagine the cistern to be full. The handle *a* is pulled raising the bell-shaped syphon *b*. When the handle is released the syphon returns to its normal position, thereby displacing a certain quantity of water which passes through the stand pipe and the flush pipe *c* into the pan. This small quantity of water displaces the air in the stand pipe and flush pipe thus creating a vacuum. The remaining water in the cistern rushes to fill this vacuum, producing a syphonic action, and the flush tank empties itself by force. The cistern is then empty and *d*, a hollow iron sphere at the end of the arm *e* (which works a little door *g* in feeding pipe *f*), sinks to the bottom. Water then enters from the upper large cistern through pipe *f*. As the water rises so does *d*, because, being filled with air, it is lighter than water. When the arm *e* is level the little door *g* is closed. Thus the whole unit works automatically. If the ball does not work to open and close *g*, water will constantly run into the cistern. An overflow pipe *h*, passing through the outer wall of the closet, is therefore provided.

In order that the water closet works properly the housewife must see that the windows in the closet are always open and the pan and walls are washed every day. She should see that there is no leak in the drain pipe and that the S-trap works effectively. In case of difficulty she should inform the landlord whose duty it is to attend to drains or call in a plumber, who is a man trained to understand drainage. She should be sure that the little cistern is working well, both in its inlet and outlet. What will happen if there is a leak in the ball? It will not rise. If it does not rise to cut off the water supply when the cistern is full, the overflow pipe will be constantly running, which means waste of water and constant wetting of the floor. It is very important that no rubbish is thrown down the drain.)

Figure 78 shows that (just before the house drain *a* enters the street sewer *c*, there should be another water trap *b* to prevent any gas from the street sewer from entering the house. Even so, the gas may penetrate the water if it is left standing for long. Therefore an air inlet *d* connected with the drain ventilates it before it is trapped. A pipe passes upwards above the roof where it is left open, provided only with a wire-netting, to keep birds from building nests in it or mosquitoes from emerging through the septic tank.

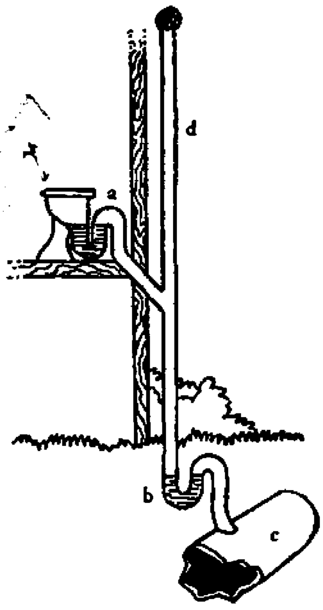


FIG. 78. Drainage system

There are many varieties of traps and methods of ventilation in the water carriage system. There are many different ways to use the best materials to achieve the most economical means of disposing sewage. These are the duties of the engineer of sanitation. When the need arises you can always consult an expert.

The Dry Conservancy System: The Pail System. In the pail system each privy which is either separated from or built on the outside of the house is provided with a movable pail placed in a hollow in the plinth. Dry earth or lime must be thrown in each time after use. Since this aspect is generally neglected, flies and other insects breed in pails where waste is deposited. A little opening in the wall enables the sweeper to remove the pail every day and replace it with a clean one (Figure 79). The full pail is covered with a tight-fitting lid and emptied into prepared trenches situated at some distance from the town or village, and then covered with earth. This pail is cleaned and exchanged with the full pail the next night. In this system, two pails are required for each house. Sometimes only one pail or even a basket is used. This is not a satisfactory arrangement as the pails cannot be cleaned properly. In some cases a very large pail is provided and is taken away only once a week by the sweeper. When this is the case, earth or lime should always be thrown in after use. The use of one large pail is not advisable in the tropics.

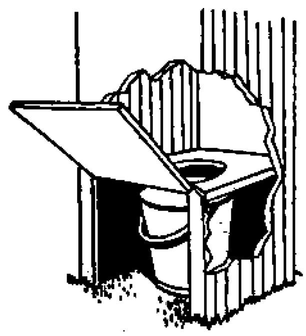


FIG. 79. Pail in hollow.

Well or Pit Latrines. The pit system has no movable receptacle and the excreta is received in a sunken hole or well which is usually two to six metres deep. It is an insanitary arrangement as foul gases are produced and the water supply is likely to be polluted by seepage, especially after a rise in the level of the subsoil water during rainy days. However, this system is less dangerous than that which results in surface pollution.

The site chosen for the pit should be on elevated ground and far away from and above the level of the water supply. The soil should be porous and the pit unlined. Clay or soil subject to frequent flooding is unsuitable. Nitrifying bacteria in the upper layers of the soil purify the excreta.

The seat should be made of tarred wood or sandstone and should rest on a layer of bricks to make it higher than the adjoining ground. A well-constructed drain should surround the pit latrine to carry away rain water.

The Bore-hole Latrine. The bore-hole latrine was devised to provide latrines in rural areas and to reduce the diseases caused by insanitary practices. It is inexpensive and requires very little space. It resembles a pit latrine and consists of a circular hole 35 to 40 cm. in diameter and 3 metres in depth. The hole must be bored at least a metre below the surface of the ground water. The top of the hole is covered by a concrete squatting plate $76 \times 91 \times 6$ cm. with a slope to a hole 25×15 cm. at the centre. The hole should be bored in hard compact soil and the site should be at least 15 metres away from any well or tank and should not be subject to flooding. When the hole is filled to about a metre from the ground level, it should be filled in with dry earth and the squatting plate removed and placed over a fresh hole. The excreta in the former is gradually decomposed by the nitrifying bacteria, which liquefy it releasing certain gases and producing valuable manure.

Sometimes the contents are burnt instead of being used on the land but this method is wasteful and costly.

RCA Latrines. In this type of latrine two pits are placed near each other away from the squatting platform. The platform is a permanent structure with the pan and trap fixed in it. The trap is connected to one of the pits by a 3" inch pipe line. The pits are covered by split bamboo matting. The platform round the pan is 90 cm. with a 7.5 cm. thick brick retaining wall around. For an average family, one pit serves for about five years and when it gets filled the pipe connection from the trap is changed to the other pit. Thus the pits are alternated at intervals of about five years. From the pit that is full, the decomposed material is removed and used as manure and a soil conditioner. The distance between the two pits should be at least two feet.

Pits should be lined with bricks on top to prevent the chances of collapse. The pits can be covered with bamboo mattings but reinforced cement concrete slabs are preferable. There should be no stagnation of water near the pits.

DISPOSAL OF WATER WASTE

Where the water carriage system is in use, the water ~~waste~~ of a household consisting of bathing water, laundry water, washing-up and house-cleaning water is carried by a separate pipe with its own S-trap outside the house into the main sewer from where it is ultimately disposed of. Occasionally a separate system of pipes is arranged. If the water carriage system is not in use, water waste is taken through a pipe outside the house, passing into an open drain, to be eventually carried into some stream or utilized for irrigating the land. This system tends to breed mosquitoes and often causes unpleasant odours.

Water coming from the kitchen pipe is often very greasy and if this grease gets cold and hardens, it may stop the trap from being effective if it is connected with the water carriage system. If it passes directly into an open drain, it will, after a time, make the soil sour. Never throw grease down a drain. You must dispose of grease separately. Always pour hot water down the drain after washing greasy cooking utensils. The trap belonging to the

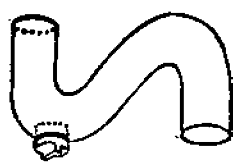


FIG. 80. S-bend with screw

kitchen drain should be provided with a movable screw (Figure 80) to enable it to be emptied in case it becomes clogged. The top of the pipe in the kitchen sink should be fitted with a perforated cover to prevent solid matter from passing through (Figure 81). If the water empties on to the ground directly, the kitchen spout should be movable and you should have a set of three trenches (Figure 82) going in slightly different directions. You should then set the kitchen spout towards a different trench each day in sequence. Occasionally scrape off the surface layer of these trenches and burn the scrapings.

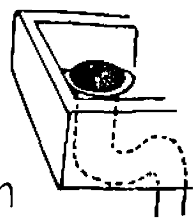


FIG. 81. Perforated cover on pipe

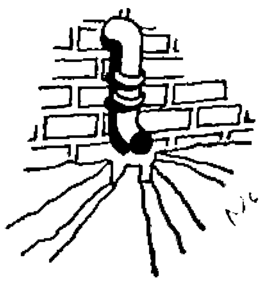


FIG. 82. Trenches from kitchen pipe

DISPOSAL OF HOUSEHOLD WASTE

Household wastes are of two kinds: (1) organic, consisting of peels of vegetables or fruits and scraps of discarded dry food, paper and rags; and (2) inorganic, mainly ash, dust and broken articles. The golden rule in the disposal of household waste is to compost all organic perishable rubbish. Keep a covered metal vessel (pail) with a layer of ash spread at the bottom and a lid provided with a handle for depositing all the waste. As soon as household waste accumulates, empty it on top of this layer. The lid should always be in position in order to avoid flies. Every day place the vessel with the refuse outside your house for the sweeper or scavenger to empty into a cart or large receptacle, arranged by the local Government for the disposal of all such waste. Waste-paper baskets should be kept in every room for disposing waste paper, rags or rubbish. If the quantity is small their contents may also be thrown into the covered pail. As rags and paper have some value they may be stored in clean sacks and sold from time to time. Keep another basket near the kitchen and place in it all unwanted tins and broken glass and china. This may also be carted away by the sweeper.

What happens to the household waste matter that the sweeper carts away? It is safest and best to burn it. Sometimes it is dumped on low ground for the purpose of raising the latter. This is not a good plan for if the ground on which waste is dumped is to be used as a building site, it will remain unhealthy for some years. Sometimes, after the removal of broken china and tins, organic wastes are spread over fields and used as fertilizers. Care should be taken that such places do not become the breeding places of flies.)

Civic conscience means that you have developed a sense of right conduct towards your fellow citizens in relation to discarding waste. The housewife should see that her home and neighbourhood are kept clean and beautiful.

Assignments

1. Study the systems employed in your school and home for the disposal of wastes.
2. Walk around your compound and see whether any waste matter is lying about uncovered.

3. Find out what system of drainage is used generally in your town or village.

4. What is being done in your town with each kind of waste matter?

5. Do cases of cholera, enteric fever and dysentery occur often in your neighbourhood? If so, what are you going to do to prevent their recurrence?

6. Name all the advantages of the water carriage system for the disposal of waste.

7. Visit different places to see (1) different types of water closets in use, (2) bore-hole latrines and (3) septic tanks. Make drawings of each. Decide which you will have in your home, giving reasons.

CHAPTER XIX

PRINCIPLES OF NUTRITION

EVERY living creature needs food to remain alive. Therefore all human beings, regardless of race, sex and other differences, need food. Food is any substance which, when taken into the body, can be digested and utilized to give energy for carrying out the different functions of the body, to give nutrients to build body tissues and materials to regulate body processes. Food is capable of being utilized by the body for the growth, repair and maintenance of vital activities. Nutrition is the science which deals with all these processes in relation to food. It teaches you how to maintain health and prevent deficiency diseases.

The amount of food a person eats is influenced by many factors, the chief among those being body requirements and hunger. Starved or semi-starved people are guided mostly by a desire to be full. Therefore their diet is predominantly rice or other cereals. But people cannot live on cereals alone. They must eat a variety of things consisting of many vegetables and protective food in the form of a balanced diet.

There are many conditions which facilitate the digestion of food, such as relaxation, appetite and contentment. On the other hand sorrow, fatigue and worry prevent the digestion of food and limit its intake. Memory and the association of food with certain people and situations plays a large part in the enjoyment and consumption of food. Neurotic people have more food dislikes and prejudices than normal people. The attractiveness of food in its appearance and preparation favourably influence people's appetites. Climate, economic and religious beliefs and superstitions also affect our eating habits. All these factors determine the food patterns, practices and habits of different communities. These in turn become part of their culture. In any programme dealing with the education of nutrition these factors have to be borne in mind.

The main constituents of most types of food are proteins, fats, carbohydrates, minerals, vitamins and water in varying amounts. In a balanced diet, all these constituents must be in the right proportion to fulfil the needs of the human body. About two-thirds of the weight of the body consists of water; proteins form approximately one-sixth while fats and minerals make up the remainder. Considering the large amount of starch and sugar eaten, only very little carbohydrate is found in the body.

Since the tissues of the body undergo constant growth and change, materials which are similar to those of which the body is composed are necessary to build and repair them. For the improvement of the race in terms of mental and physical qualities and a long, useful and enjoyable life, good nutrition is essential.

When food is digested, the digested products are brought by the blood to the cells of the body, where constant breaking down and building up of materials take place constituting *metabolism*.

Most food is not pure protein, fat or carbohydrate, but a mixture of these. Certain foods can perform more functions than others. Carbohydrates, fats and proteins are used as body fuel to give heat and energy; but proteins are chiefly body builders. Mineral salts are used not only to build body tissues, but also, along with vitamins, to assist in regulating certain body processes. The classification of food according to its functions is given below.

1. *Fuel Food*—Fats and carbohydrates are the heat and energy-providing components of food.

2. *Body-Building Food*—Food rich in proteins and minerals are body-building foods.

3. *Body-Regulating Food*—Food rich in mineral salts such as calcium, phosphorus, iron and iodine, and Vitamins A, B-complex, C, D, E and K are body regulators.

FATS

Animal sources of fat are butter, *ghee*, cream, milk, fish oils and meat. The vegetable sources are vegetable oils, olives, groundnuts, etc. Apart from giving energy, fats serve as a vehicle for the absorption of the fat-soluble Vitamins A, D, E and K.

CARBOHYDRATES

Carbohydrates are so called because they contain carbon, hydrogen and oxygen in the same proportion as in water. They are classified into mono-, di-, tri-and poly-saccharides according to the number of saccharied groups present.

Carbohydrate Sources. (1) *Sugars* from fruit, jaggery, white and brown sugar and honey.

(2) *Starches* such as cereal grains, *dhal*, beans, nuts, tuber and root vegetables and bananas.

(3) *Cellulose* (or roughage) present in fibrous food such as vegetables and fruits.

Oxygen in the air combines with the carbon in fuel food, giving off carbon dioxide and water releasing heat. Similarly oil, *ghee*, sugar or *dhal* burn in the body and get oxidized, giving off carbon dioxide and water, releasing heat by which the warmth of the body is maintained and energy for work is provided. Scientists have determined the amount of heat which each type of food will furnish the body and have indicated this quantity in terms of *calories*. A calorie in nutrition is a large calorie known as a kilo calorie (kcal) which is the amount of heat required to raise one kilogram of water through 1°C. Thus in measuring the heat values of food, the large calorie, which is a thousand times greater than the one used in physics, is used. The gramme is also used as a unit of weight for food.

One gramme of sugar or starch furnishes four calories of heat in the body. A gramme of pure protein also provides four calories of heat while one gramme of fat furnishes nine calories of heat. When carbohydrates and fats are in adequate supply, proteins are used for growth and repair which is known as the *protein sparing effect*.

PROTEINS

Protein foods provide flesh-forming materials. They are necessary for the muscular cells. This is because protein contains nitrogen which other foods do not. Nitrogen is an element of prime importance in the maintenance of cells and their growth.

Proteins are built up of several smaller units called *amino-acids*. There are many kinds of amino-acids. Just as different combinations of letters build different words in a book, the different combinations of amino-acids build up very many proteins, which are different from each other. Some amino-acids are especially important. Unless they are included in the structure of protein food, growth cannot be sustained. Such amino-acids are known as *essential amino-acids*. Proteins which contain the essential amino-acids are known as *complete* or *indispensable* proteins. Those which do not have a few or all the essential amino-acids are considered *incomplete*. For example, the protein in wheat lacks certain amino-acids and is therefore unsuitable or incomplete. If wheat is combined with milk which contains the amino-acids lacking in it, it can become complete. No living creature can grow without complete proteins and therefore children who are fed on unsuitable or incomplete proteins are retarded in growth.

Most of the protein food from animal sources furnish incomplete proteins. Thus they are divided into two groups:

1. Complete proteins generally obtained from animal sources, such as meat, fish, eggs, milk and cheese.
2. Partially incomplete proteins found in vegetable sources such as *dhals*, nuts, oil cake and cereals.

Our nutritionists have estimated that adults require 45 to 55 g. of proteins daily. Protein should furnish not less than twelve per cent of the calories required. Growing children should have more protein in their diet.

Proteins are found in a great variety of vegetables, *dhals*, pulses and legumes. The amount of protein contained in vegetable sources is very high but they lack some of the essential amino-acids. If diets are planned to include food which will supply the deficiencies lacking in others, milk, curd or eggs will help to form complete diets. Instead of relying upon a single wheat or rice source such as wheat or rice alone for protein, a variety of similar cereals would be more beneficial. Green leafy vegetables also contain good proteins, though in small quantities.

---

1 gramme = 15 grains; 1 ounce = 28 grammes

MINERAL SALTS OR ASH CONSTITUENTS

When food is burnt it leaves ash composed only of minerals. Minerals are body builders along with proteins, but they have other important functions also. There are many minerals in the body tissue. Minerals in rocks mix with the soil where they dissolve and are carried away by water. These dissolved minerals are absorbed by plants and changed into organic forms. Plants are eaten by animals. Human beings eat both animals and plants. Thus man gets minerals from three sources—water, plants and animals.

Poor teeth and crooked legs, hollow chests and poorly developed lungs are largely the result of an insufficient supply of ash constituents, particularly calcium (*chunam* or lime) and phosphorus. Sulphur and iron are always combined with protein in our food material. Phosphorus and calcium are sometimes similarly combined, but we also get them in other forms.

Iron is an essential element of the red corpuscles of the blood. It enables them to carry oxygen. If the body lacks iron, it must work twice as hard to purify the blood and this may injure the heart by overtaxing it. Every cell of the body requires iron as an integral part of its nucleus, so that our very life depends upon the supply of iron. Egg yolk, meat, liver and kidney are food sources. Certain dried fruits, such as raisins and dates, are also good sources, but vegetarians are mostly dependent on green leafy vegetables, such as amaranth (*keerai*), radish tops, and wild greens.

Calcium or lime is necessary for the formation of bones and teeth. Deposition of calcium in the bones is dependent upon the amount of phosphorus and magnesium present. Therefore both these elements must be supplied in the proper proportion. To be fully utilized in the body a sufficient supply of Vitamin A, C and D is also essential. Even when calcium is adequate, the spine and thorax may become crooked and the lungs therefore compressed. Consequently breathing will be affected.

Calcium maintains the contractile power of muscles. It strengthens the nervous system and increases the coagulability of blood.

Expectant and nursing mothers require a generous amount of calcium in order to supply it for the development of the baby's skeleton and teeth. The teeth are formed in the gums before the baby is born. The expectant mother needs one gramme of calcium per day. This amount can be supplied by a litre of milk. When calcium is lacking in the diet or when its balance with the other minerals and vitamins is upset, stunted growth, rickets, knock-knees or bow-legs, pigeon chests and other bone deformities result, Such deficiencies result in diseases such as *osteoporosis,* particularly with older people which is a disease causing brittle bones, and a disease called *osteomalacia,* which causes bone deformities of the pelvic girdle in the case of women. Young children lacking calcium start eating earth.

Sources of Calcium. Milk is one of the best types of food giving calcium in its best form to children. Milk products other than ghee and egg yolk also contain calcium. Green leafy vegetables including their stems are rich in calcium and adults secure most of their supply in this form. ***Ragi*** is rich in calcium. Cluster beans, drumsticks, beetroots and *dhal* contain good amounts.

Phosphorus. Associated with calcium, phosphorus plays an important role in body-building. It helps to keep the blood neutral and plays a part in the oxidization of carbohydrates. It is also instrumental in the multiplication and movement of cells. It is estimated that adults require 1.5 g. of phosphorus per day. Children should have not less than 1g. per day. Without phosphorus, calcium cannot be deposited in the bones. Calcium and phosphorus need Vitamin D for their utilization.

Food which is rich in phosphorus are spinach and similar green vegetables, wheat, milk, buttermilk, fish, curd, legumes or *dhal*, *ragi*, nuts, fruits, vegetables such as radish, cucumber, carrot and cauliflower, and egg yolk. Phosphorus is found in greater quantities in the seeds of plants rather than in their roots and stems.

Sulphur. If the diet has sufficient protein, the necessary amount of sulphur is bound to be present.

Sodium. Chlorine and sodium are provided by table salt and therefore there is no danger of deficiency of these minerals in Indian diets. We add common salt to most of our food preparations. Meat contains a plentiful amount of sodium and, therefore, animals that live on meat do not need to eat any salt. People who have a mixed diet require less salt. They must be careful that they do not take too much or they will injure their arteries and kidneys. Salt is an important factor in maintaining the composition of blood and the organs. Sodium helps to retain water in tissues and chlorine assists in forming hydrochloric acid secreted by the stomach.

Iodine. Iodine is essential for normal nutrition, although a very small quantity is required. Some people suffer from a disease known as *goitre*, which is the result of iodine lacking in the body. It is characterized by the enlargement of the thyroid gland and various other symptoms. Iodine is found in crude salt ordinarily used for cooking. It is also found in sea water, sea food such as fish and fish oils and in leafy vegetables and fruits grown in soils which contain iodine.

WATER

A large proportion of our bodies is made up of water. This proportion must be maintained. If there is insufficient water, the metabolism of the body will be interfered with thereby upsetting its various functions, such as appetite, nervous control, digestion and ability for work. Water is necessary to carry away the wastes of the body and to regulate the body temperature. Thus water is not only a beverage but also a part of our food. Some food is nearly all water. Greens, cucumber, lettuce. tomatoes, green vegetables and fresh fruits have over ninety per cent water in their composition. Oranges also contain plenty of water. Their juice can be easily extracted. Even potatoes. carrots and other such apparently solid food have as much water in them as oranges, that is, over eighty per cent. Even dry food such as groundnuts contain ten per cent water. When legumes, pulses and seed grains are cooked water is added to render them easily digestible. Water is consumed through beverages such as *sherbet*, tea and milk. Pure water is as essential to health as food. Water contains minerals held in solution, but the most important point is that drinking water must be clean and safe.

VITAMINS OR BODY-BUILDERS

For many years people thought that carbohydrates, fats, proteins, ash and water were all that the body required for health and growth. But early experiments with rats showed that if these foodstuffs were purified so that nothing but pure carbohydrate, fat, protein, ash and water were consumed by these rats, they were unable to grow and their health steadily declined. Something was lacking. When some cow's milk was added to such a purified diet, the rats immediately began to grow. Thus scientists became convinced that there was something else in milk besides protein, fat, carbohydrate, ash and water, which was previously unknown. The name *vitamin* was given to this unknown substance or substances. The first part of the word, *vita*, means 'life'. Vitamins are named after the letters of the English alphabet, A, B, C, D etc., but now most of them have a chemical name also. Just as oil is necessary for the smooth running of a motor car, vitamins are necessary for the proper functioning of the body.

Scientists continued their experiments in feeding animals. Many important discoveries have been made as to the nature of vitamins, their effects upon animals and people, what happens when vitamins are lacking in the diet and where they may be found. Further experiments showed that this substance required for growth was to be found in the fat of milk or butter. Thus they proved that there is something in butter and egg yolk which is essential for growth and health but which was not found in lard and vegetable fats. We now know that substance as Vitamin A. This was among the first of the vitamins to be discovered.

Rats were generally used for such experiments because the life span of a rat is only three years. One day to a rat is equal to four months in man's life and one year to a rat is the same as thirty years to man. Rats like all food which people eat, and react in the same manner to deficiencies in diets as we do. Rats do not mind living in a small space. Thus it is easy to note the effects of different diets upon rats and determine whether the diet is good or not. It is possible also to see the effects of each diet on the offspring of rats in a short time. In this way, many important discoveries have been made, proving that vitamins are essential for health, growth and the prevention of disease. Several vitamins have been discovered as being essential for growth and the maintenance of health. They are classified as fat-soluble and water-soluble vitamins. The fat-soluble vitamins are A, D, E and K. The vitas of the B-complex and C constitute the water-soluble group. A diet may contain everything else, but if it lacks any one of these growth-promoting vitamins, growth is not possible. As soon as any food containing the missing vitamin is added, the animal will begin to grow at once.

Vitamin A. Vitamin A is necessary for growth and the normal functioning of the epithelium. When Vitamin A is absent in the diet of animals and children, the eyes are impaired. A condition known as *night-blindness* affects children, who are thereby unable to see in the night. It is easily cured by a large intake of Vitamin A. In extreme conditions of deficiency, another ailment known as *xerophthalmia* occurs. It is very painful and causes swellings and inflammation in the eyes. If Vitamin A is not given at once, the eyes will become permanently blind and death may also occur. A Japanese scientist named Mori observed many human cases of this disease and found that they were curable by feeding the patients with chicken liver, fish liver, eel fat and cod-liver oil. Thus it was discovered that Vitamin A is abundantly present in the livers of animals and fish.

Many people are tempted to extract the cream from milk and use it to make butter, rich in Vitamin A. When this milk devoid of its Vitamin A content is fed to children in the form of skimmed milk, xerophthalmia will also result.

Lack of Vitamin A makes people more susceptible to certain diseases such as broncho-pneumonia and other lung troubles. Rats with a liberal supply of Vitamin A live twice as long as those on the same diet, with less Vitamin A. It has been proved also that rats with sufficient Vitamin A for health and growth successfully rear their young which live for several generations, while the offspring of those on diets deficient in Vitamin A do not live long.

Vitamin A is generally lacking in South Indian diets. Most of the nutritional problems of children can be traced to the deficiency of Vitamin A.

Milk, butter, palmoil, egg yolk, kidney, liver, green and yellow vegetables, green leafy vegetables and yellow fruits, cod-liver oil and shark-liver oil are rich in Vitamin A. Vitamin A is present as its precursor carotene is found in vegetables. Carotene is a yellow pigment and gets converted to Vitamin A in the liver.

Cod-liver oil can be purchased from the chemist and given to little children who are too young to eat green leafy vegetables. It contains three times as much Vitamin A as an egg yolk and ten times as much as butter. Prolonged heating of food in an open vessel destroys much of the Vitamin A. Therefore *ghee* is not as good a source of Vitamin A as butter.

Vitamin A is essential for:

1. Normal growth
2. Good eyesight
3. Healthy skin and epithelial tissues
4. Sound teeth
5. Healthy nerves

6. Reproduction
7. Protection against disease.

Vitamins of the B-Complex. There are at least thirteen members in Vitamin B complex, all interrelated in their functions. Of these, Thiamin or Vitamin B_1, Riboflavin or Vitamin B_2, and Nicotinic Acid or Niacin, also called the *anti-pellagra* vitamin, are important in human nutrition.

The first discoveries relating to the Vitamin B group were made during the search for the cause of the disease called *beri-beri*, which was prevalent among rice-eaters. By experimenting with fowls, feeding them with polished rice and polishings of rice, the Dutch scientist Eijkman in Indonesia found that the cause of beri-beri was due to the deficiency of Thiamin, which was lost from rice due to excessive milling. It was also found that Vitamin B_1 thiamins could be recovered from the polishings which were thrown away to cows and poultry.

Children cannot grow when Vitamin B is lacking in their diet. They lose their appetite, become sick and die of beri-beri which is the deficiency disease resulting from the absence of Vitamin B_1. This disease affects the nerves of motion and sensation. Besides unpolished rice, the bran and outer coatings and embryos of grain contain this vitamin. The use of unrefined food grain will ensure adequate quantities of Vitamin B_1. Due to milling, refined white *flour* or *maida* loses much of its vitamins and mineral salts. It is better, therefore, to use atta. Dried peas, beans and *dhal* also contain Vitamin B_1. Both Vitamin B_1 and B_2 resist high temperatures, but are soluble in water. Therefore too much washing and long soaking of cereals and the use of soda in cooking vegetables destroys these vitamins.

The food sources of the B vitamins are:

Thiamin	*Riboflavin*
Pumpkin	Amaranth (*keerai*)
Bengal gram	Red gram
Red gram	Milk
Groundnut	Yeast
Liver	Liver
Yeast	
Bran	
Germs of whole grain	

Vitamin C. The disease *scurvy* has been known for many centuries. Practical experience in many countries proved that people who ate only dried food were liable to contact scurvy, and that fresh oranges, lemons, tomatoes, *amla*, sprouted seeds and pulses, raw green leafy vegetables and tubers would cure scurvy. Now we know that scurvy is due to the absence of Vitamin C in the diet.

Sailors on long voyages and soldiers often died in large numbers of scurvy. This dreadful disease causes tenderness and swellings in joints, paralysis, loss of weight and the loosening of connective tissues. The teeth loosen, the gums get soft and bleed, and bodyaches resembling rheumatism result.

When infants are fed on heated milk only, they lose their appetite, become anaemic, irritable and weak, and fail to grow. Their teeth fail to develop properly and decay early. All these are due to a lack of Vitamin C. Vitamin C is destroyed when food is exposed to air due to oxidation, or when it is heated. Vitamin C is very sensitive to heat and is water-soluble. Therefore when vegetables are dried or soaked or cooked, with or without soda, Vitamin C is lost.

Vitamin D. This is known as the *anti-rachitic* vitamin because it prevents *rickets* in young children. Rickets is a disease in which the bones soften and bend, causing deformities such as bow-legs and pigeon-chests. The muscular system loses its tone. Therefore the abdomen distends and constipation follows. Children suffering from this disease become fretful, weak and anaemic. Vitamin D is also called the *calcifying vitamin* because it helps the body to assimilate the calcium in the diet and build it into bones and teeth.

Sunshine is a very important factor in preventing rickets. We, in India, have a generous supply of sunshine. Little children who run freely in the sunshine unclothed are safeguarded from rickets. Girls and women who observe *purdah* and those who do not expose themselves to sunshine are in danger of developing this disease which affects the bone structure of the body, deforming the pelvis and thus making child-bearing dangerous. Children with rickets usually have protruding abdomens, narrow chests, bow-legs or knock-knees, and are apt to suffer from bronchitis, pneumonia and tuberculosis. Along with calcium and phosphorus, Vitamins A and D are also concerned with the prevention and cure of rickets.

The animal sources of Vitamin D are cod-liver oil, halibut-liver oil, milk, butter, *ghee* and egg yolk. Vegetable sources are sea plants, vegetables grown in sunlight, oils and grain. Animals do not depend upon these completely since a substance in their skin can produce Vitamin D in the presence of sunlight.

ASSIGNMENTS

1. Write down the functions and sources of proteins.
2. List the important minerals needed in the body.
3. What are the food sources of calcium?
4. What are the conditions which produce night-blindness ?
5. Which are the types of food rich in Vitamin C?

CHAPTER XX

DIFFERENT FOOD GROUPS

FOOD is classified into different groups according to its composition and nutritive values. Different food groups provide different nutrients. Therefore a day's meal should include food from different groups. The important food groups and their specific contributions are discussed in this chapter.

DIFFERENT FOOD GROUPS

The different food groups are:

1. Cereals
2. Pulses
3. Nuts and oilseeds
4. Vegetables and fruits
5. Milk and milk products
6. Sugar and jaggery
7. Fats and oils
8. Meat and fish
9. Eggs
10. Condiments and spices.

1. *Cereals.* Cereals are rich sources of carbohydrates. They contain relatively less protein. They need to be supplemented with other food rich in protein, particularly animal proteins. The proteins of cereals are not *complete* because some of the essential amino-acids are missing in them. They must be supplied from other sources, such as milk and its products—curd, buttermilk and cheese. There

is very little fat in the cereal grains. The use of cream, milk, butter, oilseeds and nuts can make up for this deficiency.

The *whole grain* of cereals contains some Vitamin A and B_1. But it lacks Vitamin C which can be supplied by green leafy vegetables and sprouted gram. Some of the cereals which are commonly used in India are rice, wheat, *jowar* (*cholam*) *ragi*, maize, and *bajra*.

Cereals contain very little calcium. This lack must be made up through milk and green leafy vegetables which are rich in calcium.

The Milling of Cereals. Flour from which bread is made comes from the *endosperm*, that is, the core of wheat grain. This core and the outer husk, which is the bran layer, are bound together by a thin layer known as the *aleurone* layer. At one end of the grain is a small area which becomes active and sprouts when the seed is planted; this area is called the germ.

As already pointed out, Vitamin B is found in the outer coating of cereals like wheat. In the patent processes of milling, the aleurone layer and the germ are often removed with the husk. Along with them the vitamins and minerals are also lost. When wheat is ground between the two stones of a *chakki*, the aleurone layer and the germ, which are rich in protein and phosphorus compounds, are retained. White flour (*maida*) contains only the endosperm which is chiefly composed of starch cells.

There is a network of protein in flour cells and starch granules are closely interspersed with them. When the flour is moistened and kneaded for bread, the protein present becomes fibrous and gummy. Whole kernels of wheat and *ragi* are superior, both in taste and food value, to the white, devitalized patent flour.

It would be of greater advantage if rice is husked and not polished. The polishing of rice deprives it of both its minerals and vitamins. Due to the custom of eating polished rice in China and Japan unpolished rice is looked upon with distaste. They do not realize what a serious effect it can have upon their health. Unpolished rice contains not only starch, but also some of the mineral matter and vitamins that are essential for growth and health.

Parboiled Rice. Parboiled rice is paddy which is first steamed in the husk and then husked or milled. During parboiling the heat toughens the inner bran layer and facilitates the nutrients in the outer layer to permeate inside, making shelling difficult. Thus the inner bran, the embryo and the aleurone layer are preserved. The inner bran is rich in vitamins and minerals. The embryo also contains valuable vitamins and salts and the aleurone layer is rich in proteins.

Raw Rice. If paddy is not boiled before husking, the inner bran, embryo and aleurone layer are removed when it is highly polished. Only the endosperm which is rich in starch will remain. Thus *parboiled* rice is more nutritious than *raw* or *table* rice.

2. *Pulses*. Pulses or *dhals* are rich in protein. They are commonly eaten with cereal grain like wheat, rice and *ragi* in most of the Indian diets. Man cannot assimilate an unlimited amount of *dhal*. Therefore it is wise to combine *dhal* with wheat or rice in proportions not exceeding one part of *dhal* to four to five parts of cereal grain. Even a little *dhal* with milk, curd or green leafy vegetables has many beneficial effects. Wheat, rice and ragi-eaters can secure enough carbohydrate food from these sources, but they need other food to supply their needs

for protein, fat, calcium, Vitamin A, C and D. A combination of *dhal*, milk, curd or eggs, meat or fish, green vegetables and fruits can supply these needs.

3. *Nuts and Oilseeds*. Nuts and oilseeds are rich in fat and proteins. They contain some carbohydrates. The protein in nuts is almost similar to that in meat and will sustain growth. Almonds or groundnuts eaten with *chapati* made from whole wheat, *atta* or *ragi* will provide adequate protein, fat and carbohydrate. Nuts are also rich in phosphorus. Almonds are especially rich in iron.

4. *Vegetables and Fruits*. Green leafy vegetables are good sources of calcium, iron, Vitamin A and Vitamin C. They are the cheapest sources of these nutrients. Root vegetables are good sources of carbohydrates. Carrot is very rich in carotene which is the precursor of Vitamin A. With general vegetables add variety to the diet. Fruits are very good sources of vitamins though they contain more water when compared to vegetables.

5. *Milk and Milk Products*. Milk requires special care in handling, specially in a tropical climate, so that it will not spoil by the action of micro-organisms. Not only must the surroundings of the cow and the shed be kept clean, but the cow's udder must be washed with clean water before she is milked. The milker, too, should clean his hands carefully before and after milking. Clean clothing and clean vessels are important for keeping milk clean. The utensils in which the milk is kept should be washed thoroughly and rinsed, first in boiling water and then in cold water. The milk vessel carrying milk should always be kept covered with clean mul mul and placed in a pan of cold water for it to cool quickly.

Infection is easily spread by milk, as it is a liquid which micro-organisms such as bacteria thrive on. Their growth can be prevented by keeping milk cool. After milk is drawn from the udder, boil it immediately, stirring all the while so as to prevent a scum formation and then cool quickly.

Goat's milk can be used for children. It is better than cow's milk in some respects; the iron content is greater, the fat droplets are smaller due to emulsification, and there is a richer composition of Vitamins A and D. Lastly, goat's milk is easily digestible. The curd, too, is finer and children are able to digest goat's milk better than cow's milk. As goats are not susceptible to tuberculosis, their milk may be considered safer.

Curd and Cheese. From ancient times, people have preserved the curd of milk by draining off most of the moisture (whey) and keeping the curd in a cool place. They also preserved cheese in caves where moulds and bacteria attacked it, changing its flavour without destroying it. Necessity caused them to eat it and custom made them like its flavour. Thus cheese came into existence. Today preserved old cheese is a recognized delicacy in the West, while we in the East prefer to eat fresh curd. Cheese can be made with the use of rennet and sent to places where milk and curd is scarce. Cheese is rich in protein, fat, calcium and phosphorus and can be substituted for meat in the diet. Curd or cheese, taken in sufficient quantities with whole wheat bread or *chapatis* and fruits, can help to make an adequate diet for a man.

Butter and Ghee. Milk fat comes in the form of tiny globules which rise to the top when milk is allowed to stand. It is called *cream*. When milk or cream is churned, butter is produced. Milk fat in the diet yields not only heat and energy, but also supplies Vitamin A and Vitamin D which are necessary for growth and health. The custom of turning butter into *ghee* arose from the necessity to preserve milk, as in the case of making cheese.

In a hot climate, butter becomes rancid quickly due to the action of micro-organisms. Butter contains water. Boiling and straining this water helps to harden the protein present in butter and the resultant product, *ghee*, keeps longer. Butter should be boiled in a closed vessel. Otherwise the Vitamin A present in it will be destroyed. *Ghee*, being a condensed form of fat, is not attacked by ferments and will keep much longer than butter. It is an excellent source of heat and cnergy, but is becoming commonly adulterated with hydrogenated fats.

The minerals of milk are found in the whey or fluid of milk. Milk sugar called *lactose* is also found in the fluid. There is more calcium in half a litre of milk than in the same quantity of lime water. Similarly milk contains a good supply of phosphorus. Milk contains Vitamins A and B and some Vitamin D. Therefore it is a good source of food for growing children who need these materials for their bones and teeth. Milk however is low in iron and Vitamin C.

6. *Sugar and Jaggery.* They mainly supply energy. They increase the palatability of food. Jaggery is also rich in iron.

7. *Fats and Oils.* In addition to the fat added in the form of oils and *ghee* a considerable amount of fat is contributed by milk, fish, meat and nuts.

8. *Meat and Fish.* Meat and fish furnish protein in the Indian diet in about the same proportion as do seed grains or cereals.

The proteins of milk, eggs, meat and fish are complete, containing all the essential amino-acids. The amount of protein in meat depends upon the amount of lean muscle it contains. Seventy grammes of curd or *dhal* or half a litre of milk have as much protein as a mutton chop or a small fish.

Meat and fish contain about as much phosphorus as seed grain and, like them, are low in calcium. Iron is one of the chief elements of meat. The amount of iron present in meat is equal to that found in an egg yolk, two *chapatis* or two slices of whole wheat bread, or sixty grammes of cooked spinach. Mutton contains a small amount of Vitamin B but it lacks Vitamins A and C. Beef contains some Vitamin A and B. Liver contains all the vitamins. If meat is eaten, it should be taken in a mixed diet with whole seed grain, *atta* bread, vegetables, fruit and milk, and not allowed to replace these. Meat protein is complete, but it is not better than that of milk and eggs. Too much meat in the diet is also not good, for the protein cannot be completely oxidized and the uric acid thus formed will cause ill health.

9. *Eggs*. Eggs, like milk and meat, contain complete proteins. They can be substituted for meat in the vegetarian diet. Like milk, the protein of eggs supplements the vegetable proteins of pulses and grain. They are more concentrated than in milk and, therefore, after a child begins to eat other food, the quantity of eggs give can be increased. The yolk of egg is rich in fat and ash constituents. Calcium, phosphorus and iron are abundant in it.

10. *Condiments and Spices*. These are accessory items which are mostly used for flavouring food. Some of them contribute essential nutrients in appreciable amounts.

Some spices like garlic are believed to contain active principles which control the growth of bacteria in the intestinal tract.

Assignments

1. How is food classified?
2. What is the composition of milk? List the qualities of milk.
3. How can milk be kept cool, clean and safe from infection?
4. Prepare cheese.
5. Why is *atta* better than *maida*?
6. Which minerals are most prominent in cereal grain?
7. What is the vitamin present in the outer layers of cereal grain? What is the value of this vitamin to us?
8. Test some starch. Compare the composition of the cereal grain you use.
9. Make a list of the green leafy vegetables you have eaten in your diet for a week. Find out their food values.
10. How can rice be cooked to prevent the loss of Vitamin B_1? Find out the different ways of cooking rice.

CHAPTER XXI

FOOD PREPARATION

COOKERY is an art which is of interest to most girls and very necessary for all housewives. The science of cookery aims at presenting food attractively, making it digestible and palatable and at the same time retaining its nutrients. Appetizing odours and pleasant flavours from food have a stimulating effect on the digestive juices. Delicate chemical changes are responsible for the aroma and flavours produced during the processes of cooking. Developing good judgement and skill in the art of cooking requires scientific training. Even when a housewife can afford to employ cooks, she should know how to guide the cook in preparing wholesome meals for the family.

We, in India, have a tendency to use spices and condiments in excess. While small quantities of condiments enhance the palatability of food, too much of them spoil their appearance, deaden the sense of taste and weaken digestion. They cause the digestive secretions to overflow from the glands until they tire and refuse to respond. Good cooks need not add a seasoning to everything and make all food taste alike. Neither do they need to add strong condiments and spices which destroy the natural flavour of food.

REASONS FOR COOKING

Food that is eaten should change into a soluble form before it passes through the walls of the digestive tract and be assimilated. Therefore all food requires cooking. Simple sugars found in fresh and dried fruits can, however, be absorbed without any change. Tasty food can be prepared by using different methods of cooking. Cooking produces appetizing flavours, interesting forms, colours and textures in foodstuffs. Different combinations of food can be produced with cooking. This helps to provide a balanced meal. The consistencies of food can also be changed to provide meals to different age groups.

DIFFERENT METHODS OF COOKING

METHOD	DESCRIPTION	HOW HEAT IS APPLIED
GRILLING	Cooking directly over a glowing fire	Direct
ROASTING TOASTING	Cooking over a sheet of metal on a glowing fire	Through heated metal
BAKING	Cooking in an oven	By means of heated air
BOILING	Cookjng in an ovén	Water at 100°C
STEWING	Cooking in boiling water	Water at 100°C
STEAMING	(a) Moist and direct: cooking in a steamer	By direct contact with steam
	(b) Dry: cooking in a double boiler, or in a pan set inside another pan containing water.	By the heat of steam surrounding the vessel
	(c) Pressure steaming	By the heat of steam under pressure

METHOD	DESCRIPTION	HOW HEAT IS APPLIED
FRYING	Cooking in heated fat which is deep enough to cover the food to be cooked.	By means of heated fats
SHALLOW FRYING	Cooking in a small quantity of hot fat	By means of heated fats
PAN-BROILING	Cooking in a fry pan or no a griddle, with little or no fat	By means of heated metal with oil smeared on it
PAN-BAKING		
BRAISING	A combination of stewing and baking	Through heated water and hot air

PLANNING TO COOK

Before beginning to cook, one should be equipped with the right tools and utensils, and have the food materials weighed, measured, cleaned, ground or anything else done to them as the case may be. The fire should be lighted or ready to be lit so that, when the process of cooking commences, there is no need to stop and search for the articles required.

TEMPERATURES FOR COOKING

For Baking. The *paper test* can be applied to test the correct temperature for baking. The temperature is right for placing food into an oven when a piece of white paper placed in the centre of the oven browns within the time specified for each food in the following table:

FOOD	TIME FOR COOKING PER ½ KG. (IN MINUTES)	OVEN TEMPERATURE	PAPER TEST (IN MINUTES)
White bread (yeast) ...	60	Hot	2
White bread (baking powder) ...	60	Moderate	3
Scones ...	10-15	Very hot	1½
Cup cakes ...	20-25	Very hot	1½
Layer cakes ...	15-20	Hot	2
Leaf cakes ...	45-50	Moderate	2½
Biscuits ...	10-15	Hot	2
Sponge cakes ...	40-50	Very moderate	3½
Custards ...	60	Slow	4
Pastry shells ...	10-15	Very hot	1½
Pies ...	30-40	Very hot*	1½
Meat and poultry ...	20-25	Very hot	1½

* Reduce the temperature during the latter half of cooking.

For Deep Fat Frying. The *bread test* can be applied to test the temperature for deep fat frying. The temperature of fat is correct for frying when a small piece of white bread dropped inside becomes brown within the time specified below:

FOOD		BROWNING OF BREAD WITHIN SECONDS
Bajjis, Pakodes	...	40
Chips	...	30
Fish	...	60
Fried potatoes	...	20

For Sugar Syrup. The *cold water* test is appropriated for syrups. Cook syrup until it reaches one of the stages indicated in the table below and test by dropping a small amount of the syrup into cold water.

SWEET PREPARATION	IN COLD WATER TEST THE SYRUP WILL MAKE A
Fudge and sweet *palas*	... Soft ball
Fondant (like chocolate)	... Soft ball
Caramels and toffee	... Hard ball
Peanut brittle	... Caramel or crack

CHANGES WHICH OCCUR IN COOKING

Fats and Oils. Fat is better for seasoning cooked food, and oils for dressing salads. They are more easily digested in their uncooked form, but if it is necessary to heat them, they should not be brought to a high temperature as heat disintegrates the fat. By frying food in fat we make it difficult for our digestive juices to penetrate the food we eat and thus delay digestion. We often overheat proteins by frying. This is a common habit of the ordinary housewife, and she should try to change it. Since fats yield more than twice as much heat than carbohydrates and proteins, people in cold climates eat more fat than people in hot climates. When fat is heated to temperatures above or below the smoking point it becomes less digèstible, a slight decomposition takes place and products are formed in it which irritate the mucous membranes and interfere with digestion. That is why the eyes and throat are irritated when we eat too much food fried in fat. The products of decomposition at high temperatures are indigestible. Fat, however, may be heated above the boiling point of water without showing any change. It must be remembered that by heating butter and *ghee* in open vessels when frying much of the Vitamin A they possess is destroyed.

Cane Sugar. Cane sugar is a double sugar. When heated with water, it is hydrolized and changed to simple sugars like dextrose and levulose, which are readily absorbed.

Starches and Cellulose. Starch grains are enclosed in an envelope of woody fibre called cellulose. In boiling water starch forms a transparent jelly. This jelly is formed when the softened cellulose swells and bursts the cell walls.

If starch is heated in its dry form it will change to dextrin, which is soluble in cold water. When further heated starch will be changed into caramel. The heat causes it to turn brown. When heated still more it turns black.

The simple cooking of starch, as in the case of rice and potatoes, consists of softening the cellulose with moisture and heat. Starch grains are capable of swelling to twenty-five times their bulk. When so distended it is much easier for the digestive juices to penetrate the mass and change it to its simpler sugars for use in the body. Figure 83 shows the effects of cooking potatoes. Similar changes take place when rice is cooked.

As potato contains much water, it may be cooked without adding any more. Half a kilo of potatoes contains nearly a cupful of water. Rice on the other hand requires a great deal of water to be cooked. However, care should be taken not to add more water than the amount required.

Starches and cellulose are found in vegetables and cereals. When the cellulose of starchy food is heated in the presence

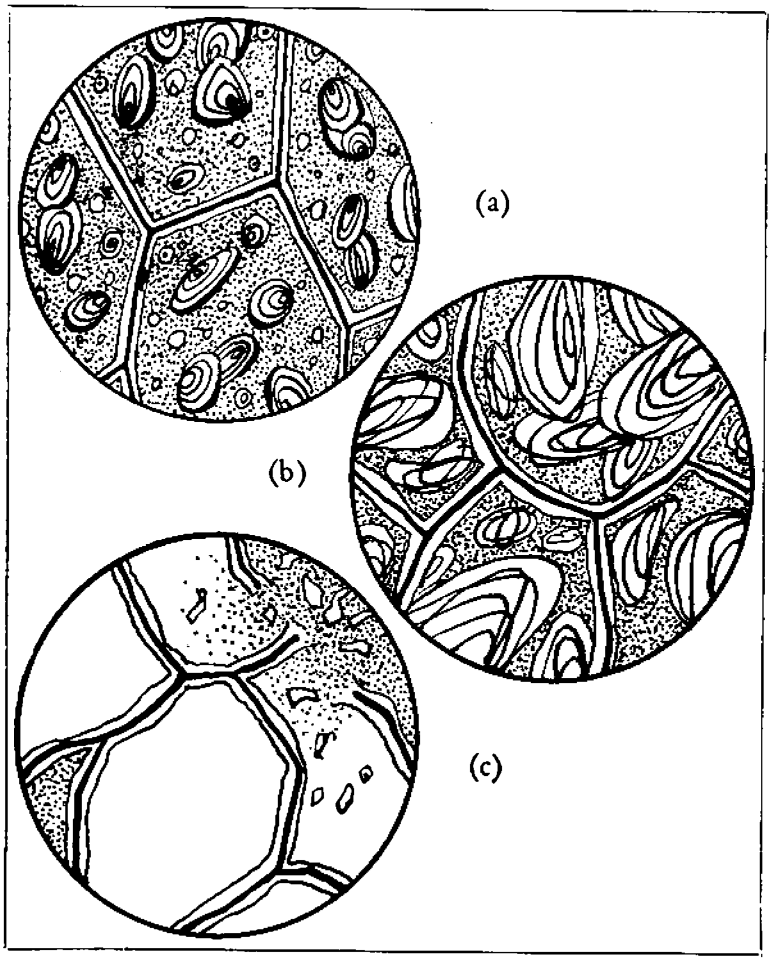


FIG. 83. Potato
(*a*) Raw, showing starch grains and cellulose structure; (*b*) parboiled starch grain rupturing; (*c*) boiled, cell structure broken down

of moisture, the cellulose is softened and the grains swell and burst the cellulose envelope, making it easier for the digestive juices to act upon them. The process is called gelatinization. This requires a high temperature, and if much cellulose is present, a long time should be allotted for cooking. The starch is then hydrolized and changed into simple and easily digestible forms.

Protein. Heat affects protein and makes it solid at a low temperature. If heat is applied at a high temperature and for a long time, it will make the protein hard and indigestible. So apply heat at a low temperature for a short time for the correct development of flavour, colour and texture in flesh food.

Minerals, Ash Constituents and Vitamins. Fruits and vegetables of juicy and succulent varieties are the type of food in which minerals and vitamins predominate. Milk is also a good source of vitamins and minerals.

Heat does not affect the minerals but if cooking is continued for a long time it will destroy the vitamins. Soaking or cooking in water dissolves much of these constituents which pass into the water and may be wasted.

Soda destroys vitamins. Food acids reduce the loss of Vitamin C during preparation. As far as possible, you should eat fruits and vegetables uncooked. Never soak them or add soda. Cook quickly in a little water at a high temperature. The acidity in citrus fruit juices prevents the darkening of sliced fruit.

METHODS OF COOKING VEGETABLES

Some vegetables contain sufficient water in their composition to make it possible for them to be cooked in the oven by dry heat. Baking ensures the retention of all their nutrients. Vegetables and cereals are often cooked in water at high temperatures, for a long or short time, according to the fineness and the size of the vegetable. A fireless cooker is the best for long-process cooking. Since the addition of baking soda destroys the B vitamins, it should be avoided.

Assignments

1. Describe the different methods of cooking.
2. Note the changes that occur when cooking fats and oils.
3. Observe starch cells under a microscope.
4. Learn how to cook vegetables without losing the minerals and vitamins.

CHAPTER XXII

FOOD FOR THE FAMILY

AT birth, the average weight of infants in India is 2.6 kg. It is gradually increasing to 3 kg. From this tiny beginning the baby must develop to twenty to twenty-five times his weight to become a man. The most rapid growth occurs in the first year. A baby doubles his weight in six months and triples it in a year. Thereafter the rate of his growth becomes slower. Between ten and sixteen years of age, boys and girls increase in weight rapidly if they are provided with adequate food. Thus, *age* is one of the factors which determines the amount of food needed.

There is some difference in the period at which greatest growth takes place between boys and girls. Boys are usually larger than girls. For these and some other reasons, *sex* and *size* also govern the food requirements. If we know a person's height and weight, we can determine how much food he requires for health and growth. A tall, thin girl needs more fuel food to keep her warm than a short, broad girl of the same weight, because the former has more body surface for the radiation of body heat. Her heart has to pump the blood to greater distances and, therefore, more energy is required.

Another important factor in determining how much food is required is *activity*. The more active one is the greater the amount of fuel one needs to obtain the required energy.

Our bodies need fuel at all times, even while we are sleeping. A man who is lying quietly in bed burns 10 calories an hour for every 10 kg. he weighs. If he weighs 70 kg. he will require 70 calories an hour, or 1,680 calories for twenty-four hours, just to keep his body warm and alive although he himself is lying still. Based on several of these facts, the fuel requirements of men, women and children have been determined by scientists. Now we are able to estimate according to one's age, height, weight and activity how much food a person needs.

Table 1 gives the approximate hourly energy expenditure, under differing conditions of activity for an average-sized man weighing 60 kg. All men do not weigh the same. Therefore proportionately more or less is required according to weight, for a larger or smaller man doing the same work.

TABLE I

*ENERGY COST OF ACTIVITIES

ACTIVITY	CAL/KG/HR
Sleeping	0.9
Bicycling, moderate speed	3.8
Playing with a ball	2.5
Dish washing	2.2
Dressing and undressing	1.9
Driving an automobile	2.1
Eating a meal	1.5
Horse-back riding, trot	5.8
Ironing	2.2
Laundering	2.5
Lying still and awake	1.2
Painting furniture	2.8

* Adapted from Taylor, Manlead and Rose, *Foundations of Nutrition* Fifth Edition, New York: Macmillan & Co, 1956.

TABLE I—(*Continued*)

ACTIVITY	CAL/KG/HR
Playing ping-pong	5.9
Piano-playing, moderate	2.6
Reading aloud	1.5
Running	8.8
Sewing by hand	1.5
Sewing, electric machine	1.5
Sitting quietly, watching TV	1.4
Skating	4.9
Standing, relaxed	1.7
Swimming, 2 mph.	9.8
Tailoring	2.1
Typing rapidly	2.2
Walking, 3 mph.	3.3
Walking, 4 mph.	4.9
Writing	1.5

Ref: Mitchell, H. S., Rynbergen, H. J., Anderson, L. and Dibble, M. V. *Co-operate Nutrition in Health and Disease, 1968.* Fifteenth Edition, p. 50, L. B. Lippincott Co, Philadelphia.

From this table, you can estimate how many calories a man uses in a day, according to his work. For example, a teacher requires food to provide energy as follows:

ACTIVITY	DURATION IN HOURS	CALORIES PER HOUR	TOTAL
Sleeping	8	55	440
Sitting at meals	2	80	160
Sitting in the classroom ...	4	90	360
Walking in the classroom ...	3	160	480
Walking to and from school ...	1	235	235
Working in the garden ...	2	230	460
Reading at night	3	90	270
Dressing, bathing, etc. ...	1	135	135
TOTAL ...	24		2,540

GROWTH AND REPAIR OF BODY TISSUES

The body's requirements of food are conditioned also by the growth and repair of tissues. The food serving this purpose is called *building materials*. It has been proved that an adult needs to have about 55g. of protein every day furnishing twelve to fifteen per cent of the day's calories. The other building materials needed are minerals to the extent of 30g. daily. The amount of vitamins needed cannot be measured in grammes but only in much smaller units.

SELECTION OF FOOD

We must now consider from what sources we should select our daily diet in order to meet our requirements, After determining the amount of energy required according to the hours spent by each member in sleeping, sitting, walking, standing, doing housework and so forth, calculate the amounts of different food needed, for example, for a family consisting of a father, a mother, a girl of fourteen years, a boy of eight years and a one year old baby.

MARKETING

Make a list of the food you require and calculate the cost. Calculate also how many calories will be available at that price and which are the most economical sources of energy. Calculate the amounts also of proteins, minerals and vitamins. Through these exercises, make a good plan for spending your money kept aside for food.

Begin by determining how much cereal grain is needed for the whole family. Write this in kilos and calories.

Next calculate how much milk should be bought. Babies and little children must have the maximum share, if possible, as much as two litres each. The older children, too, should have at least one litre each. Everyone else in the family should have half a litre each per day. Add these and calculate how many calories the milk will furnish.

Estimate how many calories you will secure from a protein source of food, consisting of pulses (*dhal*), eggs, cheese, fish, flesh or fowl.

Fruits and fresh vegetables of all sorts and kinds must be included in a much larger amount per head than is ususally allotted. The rest will include *ghee*, butter, sugar, oil and condiments.

Count up the calories from each group separately, and consider whether your choice has been wise and good. Work out percentages and the total calories for each group.

The following points will help to show you how to spend the money you put aside for food.

Divide the money put aside for food into five parts. Spend one-fifth or less on vegetables and fruits; one-fifth or more on milk, cheese and curd; one-fifth or less on meat, fish and eggs; one-fifth or more on bread and cereals; one-fifth or less on fats, sugar and spices.

Cereals, fruits and vegetables should be varied and not all of one kind. Leafy vegetables and citrus fruits should be eaten at least once every day. Fresh fruit and raw vegetable salads should be eaten frequently. Milk must be used generously. Avoid eating tinned and preserved food if fresh food is available.

Food should be measured or weighed before cooking so that you are sure that you are taking a sufficient amount of food. The equipment used for measuring and weighing food is given in Figure 84.

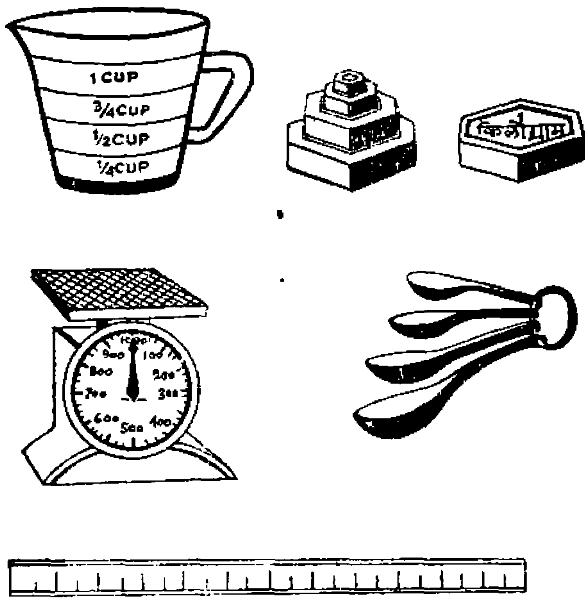


FIG. 84. Equipment for measuring food.

A day's menu for low, middle and high income families is given in Table II, and the ingredients, amount and cost of the same are given in Table III.

TABLE II

A DAY'S DIET FOR A FAMILY OF FIVE MEMBERS WHO BELONG TO LOW, MIDDLE OR HIGH INCOME GROUPS

	INCOME		
	LOW	MIDDLE	HIGH
BREAKFAST	Ragi dosai Groundnut chutney Papaya	Dosai Tomato chutney Plantain Coffee	Aval uppuma Egg omelette Banana Coffee
LUNCH	Chola kali Keerai kootu Onion chutney Buttermilk	Rice Drumstick sambar Keerai pugath Carrot salad Curd	Rice Green gram dhal kootu Tomato and carrot salad Lady's finger sambar Keerai pugath Curd
TEA	Wheat malt	Bajji Chutney Coffee	Coconut toffee Grapes Coffee
DINNER	Plain rice Drumstick leaves sambar Buttermilk	Chapati Vegetable kuruma Grapes Milk	Wheat chapati Mutton curry Peas curry Milk Plantain

TABLE III

INGREDIENTS, AMOUNT AND COST FOR A DAY'S DIET FOR DIFFERENT INCOME GROUPS

LOW			MIDDLE			HIGH		
INGREDIENTS	AMOUNT (g)	COST RS.	INGREDIENTS	AMOUNT (g)	COST RS.	INGREDIENTS	AMOUNT (g)	COST RS.
Ragi flour	500	0.50	Wheat flour	500	0.70	Rice flakes	500	1.00
Cholam	500	0.50	Parboiled rice	700	1.25	Green gram dhal	200	0.50
Wheat flour	200	0.30	Red gram dhal	100	0.20	Rice	500	1.25
Rice	500	0.75	Black gram dhal	100	0.20	Potato	250	0.25
Drumstick leaves	200	0.05	Amaranthus	375	0.15	Carrot	50	0.10
Red gram dhal	200	0.40	Carrots	150	0.30	Tomato	100	0.05
Black gram dhal	75	0.15	Drumstick	100	0.05	Amaranthus	200	0.10
Groundnuts	200	0.25	Curd	150	0.30	Lady's finger	300	0.60
Papayas	200	0.10	Onion	100	0.10	Eggs (5 Nos.)	200	2.00
Buttermilk	250	0.15	Potatoes	200	0.20	Mutton	300	2.00
Onion	200	0.10	Grapes	250	0.50	Ghee	100	1.00
Amaranthus	200	0.05	Lime	50	0.25	Curd	500	0.50
			Coconut	50	0.15	Banana	200	0.40
			Sugar	250	0.40	Grapes	300	0.90
			Milk	1000	1.20	Wheat flour	400	0.70
			Tomatoes	500	0.25	Onion	100	0.10
			Banana	100	0.10	Coconut		
			Oil	250	1.00	scrapings	250	0.75
						Oil	250	1.00
						Sugar	350	0.60
						Milk	1500	1.80
TOTAL		3.30			7.30			15.60

Assignments

1. At what age does the greatest growth take place?
2. Plan the daily meals for a child under twelve years of age. Prepare and serve the meals planned.
3. What are the factors which determine the amount of food you need?
4. What are the chief characteristics of each group of foodstuffs from which we select our diet?
5. How much of the money set aside to buy food should we spend on each group of foodstuffs?
6. How many hours do you spend sleeping, working, playing and doing other work? List and work out your daily requirements of calories according to your activities.
7. Plan an adequate diet for yourself.
8. Determine the quantity of food required to supply all the needs of your family for a week. Work out its cost.
9. What are the chief faults in your diet? How can they be corrected?

CHAPTER XXIII

CARE OF INFANTS AND YOUNG CHILDREN

Materials and Equipment required: Basket for cradle, mosquito netting, bedding, large baby dolls, infants' and young children's clothing, safety-pins, rubber cloth.

EVERY girl looks forward to the time when she may become a mother and have children of her own. Most girls help their mothers in caring for little brothers or sisters at home. It is therefore necessary to learn the right ways of bringing up children.

Every infant needs ample sleep and rest, fresh air, regular baths, regular feeding, safe water, prompt attention in sickness, muscular exercise, suitable clothing, proper mothering and training in good habits.

SLEEP AND REST

A baby needs abundance of sleep. A newly born baby normally sleeps for nine-tenths of the day. At six months, it should sleep at least two-thirds of the day. If it is sleepless, it will be uncomfortable. Sleeplessness may be due to being fed irregularly or too often; hunger, being wet, cold or hot, being oppressed by an excess of bed-clothing and overheating, irritation of the skin, insufficient ventilation and thirst.

HOW TO MAKE A BED FOR A BABY

A basket or cradle or any flat surface with little enclosure would make an excellent bed for a baby. Rocking is not necessary. Place a mattress at the bottom and over it a small pillow. The latter should be easily washed or changed when soiled. Lay a piece of rubber cloth over the pad and cover it with a double fold of clean old cloth. Chaff makes a good filling for the tiny head pillow. In the hot weather, the baby can lie on this, dressed only in a napkin. At night, it will require more covering, and the bed can be prepared more or less as follows:

1. Place a clean woollen blanket over the basket or cradle, and on this lay the mattress.
2. Over this place the chaff pillow.
3. Lay a piece of rubber cloth over the chaff pad.
4. Cover this with a piece of old blanket, and lay the tiny chaff pillow in place.
5. Cover the baby with a loose, fluffy shawl.
6. Fold the blanket over the sides and turn up at the foot and secure it with safety-pins. This should not be too tightly fastened, as it should allow some room for the baby to kick and move.

The amount of covering required depends upon the season and climate. Hot water bottles may be put between the mattress and chaff pad, if the weather is cold.

The baby should not sleep in the same bed as his mother. This is both unhealthy and risky, as the baby may be crushed.

Where should the cradle or basket be placed for the baby? Not at the side of the mother's bed, but at the side of a window. Place a screen to prevent the draught, but keep the window open and allow fresh air to circulate all night. If the baby is tucked in well and his bedding pinned, he can sleep in a cold room and be all the better for it. He should sleep in a sheltered verandah protected from the sun in the day time.

Since diarrhoea and similar diseases are spread by flies, and malaria by mosquitoes, these insects may prevent the baby from being able to sleep by sitting on him. The baby must therefore be protected from all these enemies by a piece of mosquito netting fastened carefully over his cradle or bed. The ideal thing is to screen the room itself, but if that is impossible, one can always use a small piece of netting.

BATHING

A warm sponge bath should be given every day, either in a small tub or by laying the baby on the mother's legs and pouring warm water over him.

The nose and mouth should be kept clean, but gentleness must mark all such care. If the eyes show a discharge and the eyelids are swollen, call the doctor at once. Any soreness or redness of the skin should be treated with oil or special powders. Sunlight and fresh air are the best treatments for a baby's skin, together with perfect cleanliness.

In the excessive heat, the baby can be made more comfortable by giving him a sponge bath two or three times a day. In spite of all these precautions, if he gets heat rash place him in a bath to which has been added 14 g. of bicarbonate of soda. Do not keep him in a chilly room but in a cool, well-ventilated room. He should be taken out into the fresh air in the early morning and evening. A baby feels the heat more than adults. Heat makes anyone irritable. Therefore keep him quiet by keeping him cool, without exposing him to draughts.

FEEDING

The baby must be fed every four hours except at night.

Do not give the baby any food between meals, but give a little water or fruit juice diluted with water if necessary. Be sure that all food given to a baby is clean: Milk and water must be boiled, and the water used for diluting fruit juice must also be boiled. After the baby has finished his feed, hold him up against your shoulder and pat him gently on the back to bring out any air he may have in his stomach. Too much food, food given too frequently or too much of heavy food may cause the baby to be sick, develop diarrhoea and to lose weight.

Teach the baby to chew as soon as his teeth begin to grow. Give him crusts just before meals, when he is hungry.

How to Mix Milk for a Baby. If for any reason the infant has to be fed on milk food other than the mother's, cow's milk suitably diluted can be given, water being added for the dilution. To every 100 ml. of diluted cow's milk, one level teaspoonful of sugar should be added to make the milk more sweet, as cow's milk has less sugar than breast milk and dilution further reduces the percentage of sugar. The dilution should vary according to the baby's age. In the first month it should be one part of cow's milk to two parts of water; in the second month equal parts of water and milk. From the third month till the twelfth, the water should be gradually reduced and the milk content in the feed increased. When the child completes one year of age, cow's milk can be given undiluted.

In circumstances where fresh, clean milk of the cow, goat or buffalo is not obtainable, or does not agree with the baby, condensed or dried whole milk may be used instead. Fresh milk is better than dried or condensed for general use. When giving condensed or dried milk mixtures, it is necessary to give the baby orange or other fruit juices every day.

How to Prepare Milk for a Baby. Clean carefully and thoroughly all utensils, including the bottles and nipples. Then scald them with boiling water. Do not dry them on a cloth but place them on a clean sufrace. They will dry sufficiently if they have been scalded in boiling water.

Measure sugar into a jug, add boiling water and stir till the sugar has dissolved. Add the boiled milk and mix well. Bring the mixture just to the boil again and then cool as quickly and thoroughly as possible. Keep it in a clean place, not in the sun but in a draught. The jug must be covered to keep away flies and dirt, but not so as to exclude air. Stir before using.

Never give food either too cold or too hot to a baby. Warm all food to blood heat (about 37°C). To do this, stand the feeding bottle in a vessel of hot water for a few minutes, just before feeding time.

Feeding Bottles. It is important that the feeding bottle selected is of the right kind. There are different types of feeding bottles, a few such as the cylindrical and the boat-shaped. Feeding bottles should be of heat-resisting material and should be transparent. The bottle should have openings at both ends to facilitate proper cleaning. If a bottle with one opening is used, the mouth, neck and bottom of the bottle should be large. The sides should be smooth, rounded and without ridges. Round bottles are better. Nipples should not be of tough and rigid rubber, nor have large holes.

The best type of bottle is that known as the Hygeia feeder as shown in Figure 85. Here, instead of a bottle, an open glass jar is used. This jar is covered by an India rubber cap. There is no trouble whatever in keeping this bottle perfectly clean without the use of a brush. The hole in the nipple must be of the right size. If it is too large, the milk will run so rapidly that the baby will have indigestion. If the opening is too small, the baby may grow discouraged and leave off before he has completed his feed, or he may swallow air in his endeavours to satisfy his hunger, thus causing colic.

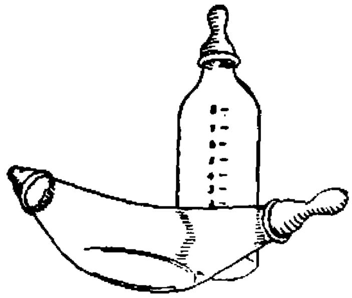


FIG. 85. Feeding bottles

A feeder with a long rubber tube is unhygienic, because it is impossible to keep clean. Boat-shaped bottles are not recommended. They have only one virtue and that is that water can be flushed through both ends. The two openings require rubber stoppers and teats, and rubber deteriorates quickly in a hot climate.

Any bottle, such as a medicine bottle, can be used if it is fitted with a rubber nipple or teat and is kept sterilized. Bottle brushes must be used to make cleaning easy.

Care of the Feeder. All articles connected with a baby's feeding should be kept clean as a precaution against illness. Sterilization is very important in the case of feeding bottles and their rubber nipples. Bottles and nipples should be rinsed in cold water, brushed in soapy water to remove any oily matter, washed in hot water, cleaned thoroughly and boiled immediately after every use. Rinsing the bottle directly after use is a healthy practice. Brushes should also be rinsed in clean water after every use and dried. Feeding bottles and nipples should not be exposed to dust and dirt. Feeding bottles should be covered or immersed in water, and nipples kept covered in a container. If the nipples are kept in water, a teaspoonful of salt should also be added to the water to prevent the nipples from softening.

Mothers and nurses who feed infants should be very careful about their own personal cleanliness apart from keeping clean the articles used for feeding the baby. They should not handle feeding bottles without washing and cleaning their hands. Since babies are very susceptible to disease, and have not as much resistance as adults, absolute cleanliness must be strictly observed by mothers.

Fruit Juice. In all cases, particularly in artificial feeding, it is advisable to give fresh fruit juice daily to infants after three or four months of age to compensate for the deficiencies that occur in processed infant food. Orange juice, lemon juice or tomato juice may be given. Make sure that no part of the fruit has decomposed. Prepare the juice immediately before use and carefully strain so that none of the solid part is included. Dilute, using twice its volume of water, which has been boiled and allowed to cool. If it is very sour, as in the case of lemon juice, add ordinary sugar. However, it is not wise to use the juice of very sour fruit, such as lemons, continuously or in large quantities. Fruit juice may be given any time after the first month, starting first with ten drops each day, increasing by a drop or two daily and later by a teaspoonful a month. It is better to give the juice about midway between meals, when the baby is awake.

At a year old the child can have a small tablespoonful of juice twice a day. Where fruits are not available, the juice of raw carrots may be used. They should be properly cleaned and kept in boiling water for a few seconds before grating and pressing out the juice through muslin, so as to avoid giving the baby any living germs from the soil which may adhere to the carrot. The juice should be strained and diluted as in the case of fruit juice.

Other Feeding Points. When eight months old, a baby can be given a piece of bread or *chapati,* toasted until it is hard. Unless it is very hard and dry, it will not serve its purpose of giving the baby something to bite and develop his teeth.

By the time a baby is nine months old, he should begin to take milk from a cup. The vegetables in his diet may be sifted through a coarser mesh so as to allow some of the pulp to go through. Other vegetables, plainly boiled, with no spice and oil, may be strained and given gradually.

When a baby is ten months old, he should take more milk from a cup. He may have some cereal porridge with strained vegetables. Highly-seasoned vegetables should not be given to a small child.

The number of feeds per day depends upon the amount and quality of milk and upon the size and strength of the baby. It is a mistake to feed too often. The stomach requires rest. Generally it is a good practice to keep the baby on a four-hour schedule.

During these days, the child is put to the breast for a few minutes at a time so that he learns to suck and also stimulates the flow of milk. Plain boiled water is given at regular intervals.

The following table suggests a good schedule for feeding the infant.

AGE OF INFANT	INTERVAL BETWEEN FEEDS	NUMBER OF NURSINGS IN 24 HOURS	NUMBER OF NURSINGS BETWEEN 10-30 P.M. AND 6-00 A.M.
1 to 2 days	3 or 4 hours	5	1 or 0
3 days to 2 months	3 or 4 hours	5 or 6	1 or 0
2 to 3 months	4 hours	5 or 6	0
After 3 months	4 hours	5	0

Breast-feeding versus Bottle-Feeding. Mother's milk is the baby's best and natural food. There is no substitute for it. Mother's milk is composed of substances designed particularly for the infant, and it is readily available to the infant at any time, warmed to the proper temperature and relatively free from contamination. Statistics have repeatedly demonstrated that infants that have been breast-fed develop digestive disorders less frequently than those who are artificially fed. In recent years, however, these differences have almost entirely disappeared, due to the availability of safe and clean cow's milk and due to new formulas which are being prepared with a view to supplying more nutritive values than before.

Breast milk may possibly convey some antibodies from the mother to her child which will protect him from disease in the first vulnerable months of life. Although the nature, intensity and course of these processes are not yet proved, recent studies indicate that immunity to certain types of infections may also be acquired in this way.

Lactation has some advantages for the mother also. It helps to restore the breasts to their normal size after pregnancy. The mother derives considerable satisfaction from supplying the fundamental food for her child, and the infant, in turn, probably enjoys the repose and security of being held by his mother at frequent intervals during the day. A similar and possibly as effective a relationship can be established, if the mother gives the bottle feeds and provides the other care required by the infant.

Weaning Infants. Normally, an infant should be weaned by the time he is nine or ten months old. It is a mistake to continue nursing a child after a year. To continue nursing for two years or more is very bad for the health of the baby and the mother.

The change from breast-feeding to complete artificial feeding should never be made in less than two weeks, except for urgent reasons. It should preferably take five or six weeks. Avoid weaning in very hot weather, if possible. While weaning, begin feeding the baby in a cup or spoon. Given below are some suggestions for weaning the child step by step :

First week : Give wheat, oat or barley jelly by spoon at 10 a.m. Begin with one tablespoonful of the jelly followed by two or three tablespoonfuls of cow's milk and the usual breast-feed. Give breast-feeds as usual for the remainder of the day.

Second week: At 10 a.m. give jelly, increased to three or four tablespoonfuls, followed by 12 to 16 ml. of humanized milk. Omit breast-feeding at this hour.

Third week:	Give breast-feed at 6 a.m., 2 p.m. and 10 p.m. only. At 10 a.m. and 6 p.m. give wheat, oat or barley jelly, followed by humanized milk.
Fourth week:	Give breast-feed at 6 a.m. and 6 p.m. only. At 10 a.m., 2 p.m. and 10 p.m. give humanized milk mixture. Give wheat, barley or oat jelly at 10 a.m. before the bottle-feed, and at 6 p.m. before the breast-feed.
Fifth week:	Give breast-feed at 6 a.m. only and humanized milk at all other feeds. Give wheat, barley or oat jelly before 10 a.m. and 6 p.m. feeds.
Sixth week:	Discontinue the breast-feed at 6 a.m. also. Give 16 ml. humanized milk instead. The baby is now weaned.

Give about 10 ml. of gruel made from suji or barley or oat flour. Cook the *suji* with water for an hour and a half and strain. Add about 6 ml. of cow's milk to the cooked *suji* and a teaspoon of sugar. The baby should also be given orange juice or tomato juice, strained and diluted with water, beginning with two teaspoonfuls and increasing to three tablespoonfuls once a day between feeds. Water must be given at least four times a day between the regular feeds.

If the mother's breasts become uncomfortable or painful during the process of weaning, consult a doctor or nurse immediately. *Do not delay.*

Whether a baby is weaned at the ninth month or still suckled, some dry, solid food, such as the crusts of bread or dry crisp toast, should be introduced into his dietary at about this time, so as to train him early into the habit of chewing and thus induce, without delay, a proper flow of saliva. This solid food would also exercise the teeth. It should form part of the meal and be given about ten minutes before any milk is given. Otherwise the baby will tend to relax his efforts. These activities lead to an increased flow of blood to the region of the mouth, which promotes the growth and development of the jaws, teeth and the roof of the mouth.

Artificial Feeding. If it becomes necessary, due to sickness or the death of the mother, to feed a baby in an artificial way, the nearest substitute for mother's milk is the milk of the goat or cow. The examination of different

TABLE IV

PERCENTAGE COMPOSITION OF DIFFERENT MILKS

TYPE OF MILK	WATER	FAT	PROTEIN	SUGAR	CAL-CIUM (MG)	CALO-RIES PER 100 ML.
(Mother's) Breast milk	88.0	3.4	1.1	7.4	28	65
Goat's milk	86.8	4.5	3.3	4.6	170	72
Cow's milk	87.5	4.1	3.2	4.4	120	67
Buffalo's milk	81.0	8.8	4.3	5.1	210	117
Whole milk powder	3.5	26.7	25.8	38.0	950	496
Skim and milk powder	4.1	0.1	38.0	51.0	1370	357

Ref, *The Nutritive Value of Indian Food and the Planning of Satisfactory Diets.*
W. R. Aykroyd; C. Gopalan and S. C. Balasubramaniam, I.C.M.R., New Delhi, 1966.

kinds of milk as shown in Table IV in the previous page has shown that they are not identical and therefore need to be modified, so that cow's, goat's or buffalo's milk could be made to resemble more nearly mother's milk.

The first problem is to get clean, whole milk and to know its source and composition. Weigh the baby and calculate the number of calories required on the following basis.

The caloric requirements of a child below one year are:

0—12 months—120 calories/kg. of body weight.
Above 1 year—1,200 calories.

The Protein requirements are:

0— 3 months—2.3 g./kg. of body weight.
3— 6 months—1.8 g./kg. of body weight.
6— 9 months—1.8 g./kg. of body weight.
9—12 months—1.5 g./kg. of body weight.

Thus a three month old baby weighing 5 kg. would require approximately 450 calories of food in twenty-four hours, to be given in the form of a litre of modified or humanized milk.

Regularity of feeding, sleeping, bathing, bowel movements and outings are important. The formation of these habits should start during the first week of life itself. Night nursing is a bad habit for a baby. At least after two months, if not from the first, there should be no feeding between 10 p.m. and 6 a.m.

Weighing the infant as soon as he is born, and thereafter once or twice a week, is the surest way of knowing whether his rate of growth is normal. A baby should gain about

170 g. a week during the first five months, and 100 g. a week during the next three or four months. If, therefore, a baby weighs 3 kg. at birth, he should double his weight in five or six months and should then weigh 6 kg. When nine months old, he should weigh about 8 kg. If a baby does not grow in this way a doctor should be consulted. Another way of judging whether the food given is agreeable to the baby is by noticing how he behaves. If he sleeps well and seems happy and comfortable, digests food, drinks adequate water, shows eagerness to have plenty of food, has regular bowel movements and passes plenty of urine, then rest assured that the nursing is successful.

TEETHING

Teething need not be a time of anxiety for the mother if she has observed the rules of health. The secret during this time is to avoid chills and to keep bowel movements regular. Let the baby have plenty of water, ripe, clean, fresh fruit or fruit juice and, if old enough, light food including milk.

The milk teeth normally begin to appear between the seventh and twelfth months. By the end of the second year, a set of twenty teeth should have come through the gums. The teeth come in groups, thus allowing intervals of rest. During the early years of childhood, the bones are flexible and easily moulded. The practice of using a dummy or pacifier is, therefore, to be condemned. These rubber teats, fastened to a cord, are supposed to provide enjoyment for the child and keep him quiet. Sucking such a dummy, however, is highly injurious, as contraction of the bones of the mouth and nose results. The teeth will then come out irregularly and even out of place. This will induce mouth breathing leading to adenoids and enlarged tonsils. More than all these evil effects, the dummy which is wet with saliva from sucking is frequently dropped on the floor; flies sit on it and germs are thus carried into the mouth. Therefore sucking a dummy is a filthy, unhealthy and ugly practice. It should never be permitted.

EXERCISE

Exercise is as important for an infant as it is for older children and adults. The baby's nervous and muscular systems demand exercise. He should be allowed the opportunity to kick and wave his arms, unhampered by clothing, for five or ten minutes at least twice a day. A pen can be arranged, with a soft quilt laid on the floor, where he can crawl and play with safety, rolling and tumbling without harming himself. In this way, he will gradually learn to pull himself up, to stand and to walk. Supply harmless play-things such as blocks of wood with which he can build. The following inexpensive Montessori materials are excellent means of early education in nervous and muscular control and for mental growth. They are:

Drop-in toys
Form boards
Assorted hollow blocks
Geometrical blocks
Assorted beads
Threading Trays
Different types of pyramids
Coloured cylinders
Assorted coloured sticks
Child-sized household equipment and materials.

CLEANLINESS

Cleanliness with regard to food and all other activities is of utmost importance in keeping the baby well. Germs thrive in dust and hot weather. It is necessary to take special precautions against their entry into food. The breast-fed baby is not in so much danger from summer complaints, such as diarrhoea, as the baby who is fed artificially. Nevertheless, cleanliness must be the watchword in everything which concerns the baby. Cleanliness of food, clothing, body and dwelling is essential.

CLOTHING

In planning an outfit for an infant, it should be remembered that loose garments are more suitable than tight ones, because of the climate. Also because of their rapid growth from birth to two years of age, the clothing must be loose since the aim of clothing is to preserve an even temperature over the entire body. All fashions must therefore be subordinated to this essential need.

The only tight binding permitted during the first two weeks is a flannel band, 15 cm. wide and 68 cm. long, which is wrapped tightly about the abdomen, to secure the umbilical cord dressings and keep the body warm.

A loose vest may be worn, like a little undershirt, to protect the chest and abdomen from a chill. If this has a tab on the lower edge, front and back, the diaper may be pinned to it for support.

Diapers are best made in an oblong shape, 91 cm. long and 45 cm. wide. These can be doubled to form a square and again folded once or twice to form a triangle. This is wrapped about the hips and between the limbs to form drawers. These several layers are advantageous in keeping the body warm and preventing moisture from penetrating and spoiling the outer clothing. It is a common sight to see many babies and little children going about without sufficient covering over the vital parts of their bodies. This exposure is dangerous, as infection from dust and dirt may result in skin diseases.

Care must be taken not to bunch the napkin too much between the legs, or the bones of the legs and pelvis will become deformed. Soiled napkins should be changed immediately and placed in cold water, washed and dried in the sun. Never dry a wet napkin without washing it. At night extra padding may be placed in the napkin to absorb the urine (Figure 86). This padding should be of clean, soft, absorbent material.

When the child has been trained in proper habits, the diaper may be abandoned and drawers substituted. Drawers should never be tight in either waist or stride. In cutting out the drawers, make the curve shallow, in order that the leg length may be short in comparison with its width, and thus avoid any restriction in walking or sitting.

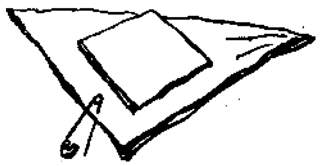


FIG. 86. Child's napkin and pad

One common defect in the garments we make for our children is that they are too tight about the waist and have unnecessary frills, embroidery and lace, hindering the free circulation of blood. Clothing should, therefore, hang free from the shoulder.

A slip or loose frock should be worn over the vest. This may be cut according to a simple pattern and of a size sufficient to allow for the baby's growth. The neck of the slip may be made to fit by inserting a tiny tape which will draw it up according to the size of the baby's neck. The sleeves can also be tied at first while the infant is small. Vests can be easily made with good white mul mul and can be easily cleaned. They will last for at least a year.

The gaudy ready-made frocks displayed in the bazaar are often too small for comfort, and of such poor material that they will not wear well. The tinsel and lace tarnish quickly and tear and the colours fade. This fading on moist skin is a real danger to the health of children, as cheap dyes used may poison their skin. Simple, white, washable, loose frocks are therefore recommended. Children should be protected from changes of temperature in the nights and mornings by a light flannel jacket. Booties or short stickings may be used to keep the baby's feet warm during the cool hours of the morning and evening and to protect them from extreme cold and changes of temperature. A long wrapper of warm cloth may be worn over the slip or a loose frock to prevent a chill in moist or cool weather. This can easily be removed when the day grows hot.

When the climate is damp and cool, a cap is advisable. The head covering, if used, should be cool, light and porous. The head and eyes of little babies ought to be shaded from strong, direct sunlight; and when the weather is hot and dry a shade should be used to protect their eyes. A bonnet for this purpose may be made with a stiff brim, and a soft comfortable top.

All garments worn in the day should be changed before putting a child to sleep at night. A loose slip, or nightgown with a draw-string through the hem at the bottom is excellent. The feet can be tied in like a bag and protected from the cold at night.

ASSIGNMENTS

1. With a doll and a small basket, practise making a cradle for a baby in hot and cold weather. Why should the infant have netting over his cradle?
2. In the sewing class, make the bedding and clothing for a baby doll. How would you prepare a baby's bed?
3. Using cow's milk, prepare food for a baby who is six months old, for half the required number of feeds per day. Why is it best to prepare only half the day's food at one time?
4. Visit the children's ward of a hospital or a baby welfare clinic.
5. Collect pictures of different kinds of cradles used for babies in India. Write down their advantages and disadvantages.
6. Attend a baby show and record your observation.
7. Observe healthy and sick children and note the differences.
8. How would you plan a baby's day so that sleep, food and baths would be given at proper intervals?
9. How can you tell whether his food is agreeing with the baby, and that he is growing properly?
10. Why is a dummy bad for a baby?
11. Why is mother's milk better for a baby than bottle-feeding?
12. Why should orange and tomato juice be given to a baby?
13. At what age is cereal added to a baby's diet?
14. How may a baby be best weaned?

CHAPTER XXIV

CHILDREN'S DISEASES

CHILDREN, if neglected, are liable to suffer from a lot of minor ailments. If not immediately attended to, children's diseases may develop into major crises causing impaired health, stunted growth, or even a threat to life. Parents should realise the seriousness of any disease in children. If they know how they are caused, they can protect their children from diseases. The diseases which occur commonly in childhood are:

1. Colic
2. Constipation
3. Diarrhoea
4. Common cold
5. Croup
6. Convulsions
7. Eczema
8. Prickly heat or heat rash
9. Scabies or Itch
10. Worms
11. Whooping cough.

The nature of these ailments and their preventive measures are discussed in the following pages.

1. *Colic*. Colic is the term applied to a severe pain in the stomach. The symptoms are crying, a distended abdomen and cold feet which the baby draws up tightly against his body. It is important to keep him warm. Fill a bottle with warm water, cover it with a cloth and lay it at his feet. Give him some warm water in which a little bicarbonate

of soda has been dissolved (a pinch in a teaspoonful of hot water). Rub his abdomen with castor oil, and place a flannel cloth, wrung out in hot water, on his abdomen. Be careful not to burn or scald his tender skin. Cover him and keep him warm. Colic is often caused by indigestion or constipation; an enema should then be given, consisting of a cupful of warm water at 70°C. containing half a teaspoonful of purified glycerine. This is introduced into the rectum by means of a small rubber tube. A rubber ear syringe can also be used. Sometimes fifteen drops of cod-liver oil, if given two or three times a day, or even gingelly or sesame oil, will correct the tendency to constipation. Massaging the abdomen from the right side to the left, across and down the left side, in a circular motion, is the best way to stimulate bowel movements.

Soothing syrups and opium should never be given. If a baby is in pain, find the cause and remove it. Is he being fed too often or is he being given too much food? Reduce the length of time given to nursing and lengthen the time between feeds.

The nursing mother will not only wish to cure colic but also to prevent it. The chief causes of colic are:

(i) Milk of the wrong composition, which may be due to the mother's health, or unsuitable artificial food. In the former case colic can be prevented by giving a few teaspoonfuls of boiled warm water before feeding. The mother should regulate her own diet and take proper exercise to make her milk normal.

(ii) Overfeeding, which can be determined by the condition of the baby's bowel movements.

(iii) Irregular or too frequent feeding. If this is the cause, wait an extra half hour between feeds.

Perhaps the food is taken too rapidly or too slowly; if artificially fed, the hole in the teat may be too large, or too small so that the milk gets cold before the baby has finished sucking.

(iv) Constipation or diarrhoea in the mother or child.

(v) Chilling the baby's body by bathing him slowly, a wrongly prepared bed, wet napkins or cold feet.

(vi) Insufficient exercise and activity of limbs and body.

2. *Constipation.* Constipation means the absence of normal bowel movements. Since the composition of the mother's milk is suited for the easy digestion of the infant, breast-fed babies seldom get constipated. But, if manufactured baby food is given in wrong proportions, there is the possibility of constipation. The introduction of new solid food sometimes causes constipation, During such times, babies should not be given laxatives. Water given between feeds, with or without sugar, may help to relieve constipation. It is advisable to give juices of fruits like orange or tomato to facilitate easy and regular bowel movements.

3. *Diarrhoea.* Diarrhoea is characterized by too many loose motions, which are frequent and watery, often containing mucus. One of the main causes of infant mortality in India is infantile diarrhoea, which is a common disease among babies. Much care should be taken to provide clean feeding since disease-producing germs gain entrance into the baby's body through food and water. Only boiled milk should be given to infants.

Mild diarrhoea can be prevented by cutting down the sugar in the feeds and reducing the fat content in the milk by diluting it. Acute diarrhoea has the symptoms of numerous watery stools, vomiting and fever with the prostrate form of the baby. Consult a physician immediately since it can prove fatal if delayed.

4. *Common Cold.* Since cold is a commonly recurring condition in children, it is known as the common cold. Cold is caused by viral infection and is not due to the nursing mother's intake of any cold food or buttermilk. Exposure to chill, wet feet, wet diapers, or wet clothing may precipitate the infection. People suffering from a cold should avoid handling children so that they may not be infected. A running nose, watering eyes, headache and sometimes a rise in temperature are the common symptoms of cold, which may lead to a sore throat also.

The preventive measures for a cold is the intake of Vitamin C in drops, such the juice of citrus fruits. Swathing the child in woollen clothing is necessary. Nasal drops can be used to avoid nasal blocks and difficult breathing. Ointments which may harm the child's skin should not be applied as they are used for adults.

5. *Croup.* When a child suffers from croup, it is due to inflammation of the vocal cords. Coughing, hoarseness and difficulty in breathing are the symptoms. Croup usually troubles the child at night.

Croup should be treated by applying hot fomentation to the throat. The room should be kept warm. The child should be kept out of cold draughts, but the room whould have plenty of fresh air. Wet towels with the water wrung out should be hung around to keep the room moist. A doctor should be consulted lest croup should develop into diphtheria or a *stup* infection.

Croup may sound alarming, but it need not be dangerous. Sometimes a hoarse and bark-like cough may be symptoms of diphtheria or other throat troubles; therefore, a doctor should be consulted. If it is only a croup the mother can treat the child herself. The child usually awakens suddenly at night coughing in a loud and brassy manner and is scarcely able to breathe.

6. *Convulsions*. Convulsions are dangerous to life and damaging to the nervous system. The chief point is to help children develop a strong constitution that will prevent convulsions. Regularity of the bowels is of utmost importance. The attack may be preceded by indigestion, colic and teething. The symptoms of convulsions are squinting, rolling eyeballs, twitching fingers and thumbs jerking into the palms of the hands, stiffening of the neck, the throwing back of the head, and the jerking of limbs The mother should act quickly to prevent further fits. First, give a warm salt enema, and apply pieces of cloth wrung out of hot water to the abdomen, being careful not to burn the skin. Give a teaspoonful of castor oil. This may cut short the attack. Second, give a warm mustard bath by putting one level dessertspoonful of mustard into a bucket or basin of water. Heat the water to about 99°F. The mother should test the water by putting her elbow into it to see that it is at a comfortable temperature. The baby may remain in the bath for two to ten minutes, and a cloth wrung out of warm water may be applied to the head. The mother should not expose the baby to chill after the warm bath. If she knows that her child has had indigestible food, gripe water should be given. She can induce vomiting by making the child consume something which he does not like (usually bitter things), but vomiting may make the child weak.

7. *Eczema*. Eczema is the commonest skin disease in babies. When it begins the skin is red and rough. Later

this becomes watery and scabs form. It is intensely irritative and the child must be prevented from scratching, as this will make it impossible for the skin to heal.

Eczema is the result of breathing and living in impure air, eating the wrong food and the lack of exercise. Over-heating, over-feeding, and constipation are frequently the cause. Too much clothing, imperfect drying after baths, soiled napkins, rough clothes all retard recovery.

In order to cure eczema, observe all the general rules of hygiene. Use clear water for baths but stop washing the skin with soap. Dab the skin instead with olive or sweet oil, but do not rub it. Tie the child's hands in little bags to prevent him from scratching. Soak the scabs with sweet oil to stop the irritation. A simple dressing, such as freshly boiled *ghee* spread on mul mul can be applied to the sore parts. This should be changed twice a day, using oil to remove the bandage if it tends to stick. A good ointment can be made by using 28 g. of white vaseline, 3 g. of zinc ointment, 2g. of olive oil and 1g. of lanolin. If, however, the doctor can be contacted, it is wise to get his advice, as the cause of eczema may be due to some microbe which requires special medical treatment.

8. *Prickly Heat or Heat Rash.* The soft skin of the child reacts quickly to hot weather. Prickly heat consists of a rash that spreads all over the skin or clusters of boils on the neck and shoulders due to profuse perspiration through heavy clothing. These heat boils may accumulate pus and cause pain. The baby's body should be kept cool by rubbing gingelly or coconut oil all over the body and head and bathing the child. The application of green gram powder and trurmeric may also help in avoiding prickly heat. Sponging the child several times a day and

applying powder will also help especially in keeping the body cool.

9. *Scabies or Itch.* Scabies, causing an itching or scratching sensation is due to the presence of contaminated articles and is spread by a small insect called the itch-mite. Hence to prevent this, people having this disease should not make contact with the child and also the child's clothing should be handled separately. A physician should be consulted for treatment.

10. *Worms.* Various kinds of worms get into the intestines. They do not cause disease but, like germs, they enter our bodies along with our food and water. They are spread by the body wastes. The most important of the group of worms is the hook-worm, which occupies the walls of the intestines and sucks blood, causing weakness and anaemia.

The eggs of the hook-worm pass out into the soil through the intestines and hatch into tiny worms. When anyone walks barefooted, these tiny worms get between the toes and work their way under the skin into the blood and finally into the intestines. By burrowing into the skin, they cause sores which are called ground-itch.

11. *Whooping Cough.* When a person has the spasms of whooping cough, fan fresh air in the face. Bathe the patient carefully to avoid chill and keep him out of the draught. Pneumonia may follow or accompany this condition. If vomiting is persistent and food eaten is lost, feed the patient soon after the spasm. Otherwise he will grow weak due to lack of nourishment. Give water freely. Sometimes a band pinned tightly about the abdomen will support the muscles when coughing and prevent their rupture. Rags or pans must be used to collect the matter

coughed or vomited out. The matter must be destroyed as it contains germs. Sometimes inoculation is used as a cure.

INTESTINAL COMPLAINTS

Children are very apt to suffer from diarrhoea and similar intestinal complaints. Their little bodies cannot kill the germs. This is the chief reason why so many babies in India die of intestinal disorders. This terrible waste of human life can be avoided by cleanliness and care. Unclean food and water are the causes of intestinal infections.

ASSIGNMENTS

1. What should be done in case of colic? How can it be prevented?
2. What are the symptoms of constipation and diarrhoea?
3. How are convulsions caused? How would you act in such an emergency?
4. What care is required for an infant who is (1) teething and (2) has a common cold?
5. What is croup? How would you treat a baby having croup?
6. How would you cure and prevent skin infections?

CHAPTER XXV

THE BUSINESS OF THE HOUSEHOLD

Materials required. Bank books and forms, prospectuses and forms for different insurances, account books, forms for making bills, the financial pages of newspapers, the agenda list for a municipal meeting in a large city as published in the newspaper and Will forms.

THE word 'business' suggests matters connected with (1) money; (2) law and property and (3) qualities such as orderliness and punctuality which are essential for the sound management of an office. Business of the household means applying these qualities in the management of the home to the satisfaction of all its members. In order to make home management a success, it is necessary to obtain training in the principles of management.

List all the items which are concerned with money, law and orderliness in the household. You will find in that list:

1. Income and budget making
2. Purchasing—ready-money and credit, co-operative stores, the keeping of accounts
3. Making provisions for the future
4. Use of surplus income; banks, cheques, investments
5. Deficiency of income, bankruptcy
6. Inheritance and property, making wills, death duties
7. Legal status: the privileges, burdens and responsibilities of citizenship.

FAMILY INCOME AND BUDGET MAKING

Family income may be derived from various sources: as rent from lands or house property, as interest from invested money called *capital*, as wages for one's daily work and as profits from business. The income may be owned or contributed by one person only, usually the father of the family, or by several members of the family—the father, the mother, grown-up relatives and children. In the past, the family money, however contributed, was regarded as the exclusive property of the father or as belonging to the person who earned or contributed it. It is now becoming increasingly common for the family income derived from the property or earnings of the husband and wife, to be regarded as their joint property so that each may draw from it as and when needed. Such an arrangement demands equal education, common sense, a sense of responsibility, knowledge of the value of money on the part of both husband and wife, and the subordination of their own desires to the good of the family. On the other hand, in many families, husbands not only keep all the money in their own hands, but even do the daily purchasing which is an unnecessary burden on those who have to go out later to do their day's work in the office or in the field. In some other cases, the husband pays for every item as the need arises, while in others, he gives a certain allowance to his wife for household expenses, and she submits an account each month.

One's income may be large, medium or small, but we all need food, shelter and clothing. Other necessities, such as care in sickness and education are also important. But the very poor can afford very little. They go without even the basic necessities or accept what is provided by the state or charity.

Besides the five primary necessities—food, shelter, clothing, care in sickness and education—those who are better off make provisions for household services, conveyance, travelling and intellectual, social and religious pursuits including charities, pilgrimages and arrangements for old age. The first five belong in the realm of necessity, the others in the realm of preferences and affluence. The proportion of the income that should be spent on necessities, tastes or choice will depend on the size of the income, the size of the family and the sense of values of the members. The poorer one is, or the larger the family, the larger is the proportion that must be spent on food. The richer one is, the more one can spend on intellectual pursuits. The apportioning of income for these different items is known as *preparing a budget*.

Budget. Budgeting helps a household to spend money carefully, since every paisa wisely spent is a paisa saved. The household budget varies according to the size and needs of the family, as well as its educational, social and economic status. Household budgets are drawn normally to cover the whole year. The following are the chief items in a family budget:

1. Housing or shelter
2. Food
3. Clothing
4. Operational and housekeeping expenses
5. Education
6. Sundries and other personal expenses
7. Savings

A specimen budget for three different levels of income is given below.

ITEMS OF EXPENDITURE	INCOME PER MONTH					
	RS. 100		RS. 300		RS. 800	
	AMOUNT	PERCENTAGE OF INCOME	AMOUNT	PERCENTAGE OF INCOME	AMOUNT	PERCENTAGE OF INCOME
Housing	12	12	45	15	120	15
Food	65	65	150	50	320	40
Clothing	8	8	25	8	70	9
Housekeeping	6	6	20	7	60	7.5
Education	5	5	20	7	76	9.5
Sundries	3	3	25	8	104	13
Savings	1	1	15	5	50	6

EXPERIMENT 1. Study your family budget for a month and fill the chart given below:

FAMILY INCOME RS.

Contributed by father .. .. ..
Mr. X .. .. ..
Contributed by Y .. .. ..
Contributed by Z .. .. ..

No. of persons in the family:
Adults .. .. ..
Children .. .. ..

TOTAL RS. ..

FAMILY EXPENDITURE

	RS.
Food	
Clothes	
Rent (or upkeep, if the house is your own)	
Conveyance charges	
Rates	
Taxes	
Light	
Education of self and little sister	
Doctor's bills	
Insurance	
Household service	
Extras	
TOTAL RS. ..	

EXPERIMENT 2. Prepare budgets for the following families:

1. A doctor, earning Rs. 625 per month. His family consists of himself, his wife, his old mother, and five children whose ages range between five and fifteen years.
2. A headmaster, earning Rs. 250 per month. His family consists of himself, his wife, two widowed sisters (one earning Rs. 130 as a teacher), six children all above five years and are being educated, with one at college.
3. A clerk, earning Rs. 125 per month. His family consists of himself, his sister who keeps house, a grown-up son earning Rs. 55 per month, and the son's wife and two young children.
4. A peon, earning Rs. 55 per month. His family

consists of himself, his wife, who earns Rs. 15 per month and her food as a cook, his old father, who earns Rs. 20 per month and two young children at school.

THE LOCAL PURCHASING VALUE OF MONEY

It is important for the housewife to understand the purchasing value of money in her own locality, not only its general purchasing value, but its variation for different commodities from day to day. If she lives in a large city, she can see the daily quotations in the newspapers for different classes of goods. If she is living in a small town or village, she should go to the market and learn the current rates. Only then she will be sure that she is getting good value for the money she spends.

In making purchases, a good housewife must consider the following factors:

Whether to buy in bulk or in small quantities.

Whether to pay ready-money or to buy on credit.

Whether to be tempted by low prices.

Whether to buy things locally or from a distance.

Buying in Bulk. The wise housewife will buy in bulk such non-perishable goods such as different varieties of grain and pulses, sugar, coffee, beans, tea, nuts and spices, firewood and cloth. A considerable amount of both money and time may be saved by purchasing in bulk. But before buying in bulk, the housewife must consider whether or not she has storage facilities, without which there will be loss instead of gain. The very poor cannot afford to buy in bulk and therefore have to buy daily, spending more for the value they receive than their wealthy neighbours.

Paying Ready-money. The danger of not paying ready-money for everything is that a housewife may spend more than she realizes and more than she can afford or need. Then when the day of reckoning comes, she may not have enough to pay the bill! Many young housewives have got into serious difficulties because of keeping running accounts instead of paying ready-money. It is so easy for a housewife to have the purchases put down in her account, whereas, if she pays the cash on the spot, she would find that she could not afford certain items and could do quite well without them. However, if her household is large and she knows how much she can afford, fixes what should be purchased daily, and has strength of mind not to exceed it, then weekly or monthly account for such articles as milk, bread and dry goods will be of great convenience. Such accounts should be settled at least every month. If one develops the habit of keeping running accounts for periods longer than one month or for amounts greater than she can pay each month, she will lose her freedom of action. After keeping a large account with one shop, she may not feel free to deal with another shop, although the goods in the latter may be better and less expensive.

Low versus High Cost. Generally speaking, it pays to give a good price for an article, if it is purchased from an honest source. On the other hand, when special circumstances cause a commodity to be less expensive, as in clearance sales, periods of concessions and rebates and wholesale shops, then one need not hesitate to buy at low costs. To preserve vegetables or fruits, one should look out for the seasons when food is selling at minimum costs for the reason, that, if kept longer they would perish. But one should never buy preserved or canned food that is being disposed of at cheap rates. They have generally been in store some time and may be spoiled or tainted. In the sale seasons in the big cloth stores, good bargains may be made in the form of remnants and ready-made clothes; but do not buy merely because articles are sold at reduced rates. Unless you really need an article, it is a waste of money to buy it, especially in a tropical land where insects are on the look out for food.

Buying Locally. Support home industries as far as possible by buying at local shops and markets. But always compare the local prices with those of goods which are brought from outside. For instance, one can often get better tea and coffee at a lower rate by ordering for ten or more kilograms at a time from a distant tea or coffee plantation than buying from a local shop. If you are travelling in a coconut-bearing district, it will pay you to bring home a sack of coconuts. Milk and ghee from not too distant a village will be much less costly, even when a mazdoor is given something for bringing them, than milk and ghee purchased in the town.

Co-operative Stores. People often feel that they are paying too much for the necessities like food and cloth. This is generally because of the 'middlemen' who are the tradesmen who act as liaison between the producer (the man who grows grain or produces other commodities) and the consumer who consumes the commodities. The middlemen need a profit for themselves. They earn their living by buying from the former and selling to the latter. Therefore they make a profit on their transactions as a way of earning their living. They are useful to both the producer and the consumer, since it will not be convenient for you to contact the farmer or the weaver every time you wanted a kilogram of grain or a few metres of cloth. And would it be convenient for the farmer or the mill manager to serve at all times of the day?

But when people found that the middleman charged too much to his customers, a number of consumers determined to set up shops based on the money contributed by themselves, appointing paid managers and assistants. People who invest their money in this way are called *shareholders* or *members*. In such *co-operative* shops, current market prices are charged for goods, but a certain percentage, generally five per cent, of the profits that accrue are divided among the shareholders, and the rest among the purchasers. The member-purchasers are given twice as much as the non-members. As the managers and buyers are appointed by the consumers themselves, they claim that they can buy goods of the best quality, and, by having the profits returned to them at intervals, cash or as goods, they pay less.

Managing the Family Income: Keeping Accounts. Keeping accounts is a good check on extravagance. In time it would enable one to become a good judge of what money will buy. A good housewife must keep a strict account of all that she spends, so that at the end of each month she may know how much she has spent for each item and see whether or not she has kept within or exceeded her budget. She should keep two books, one into which she should enter, in order, each item as she pays for it, the other into which everything should be arranged under different heads.

At the end of each month, the accounts should be finished and compared with those of the months before. It would be interesting to compare the expenditure with the corresponding month in previous years.

PROVISIONS FOR THE FUTURE

Making provisions for the future is the duty not only of the housewife, but also of the head of the family, who is generally the father. It is the responsibility of the woman to save for the future.

There are several ways of providing for the future of one's family after one's death, or for oneself in old age, when one will no longer be able to work and earn. Some people simply let money accumulate in a bank or elsewhere; some invest it, hoping that the investment may be sound; some buy a house or some land so as to get an income from the rent and leave them for their heirs, while many insure their lives with some insurance company. For a man of limited income, the last is the most satisfactory method. The amount to be paid each year is comparatively small and, if a good company is chosen, the money is safe and sure.

Life Insurance. Life insurance is a contract between an individual called the *insured* and the insurance company, whereby the former makes a money payment each year or at stated intervals to the latter in return for which the latter agrees to pay a certain amount after a specific period or at the death of the insured, if it occurs earlier, to a third party named in the contract as the *beneficiary*. Life insurance is a provision designed in such a manner that a man shall, in his lifetime, make as adequate a financial provision as he can for his family in case of his death. The contract is called the *policy*, and the periodical payment is called *premium*. It is payable monthly, quarterly, half yearly or annually. Let us take an example.

Mr. X, twenty-eight years of age, drawing Rs. 150 per month, wishes to leave behind him, when he dies, enough to pay the expenses of his burial and to leave some amount for his wife and family. By paying, let us say, Rs. 36 per year, that is Rs. 3 per month, into an insurance corporation, he can be sure of Rs. 1,000 at his death, or he may want a pension for himself and his wife, or whichever survives the other. When you thus pay into a society you are said to buy a *premium*. The younger you are when you start, the smaller is the premium to be paid. Do not buy a premium from any society until you have assured yourself, on the advice of a sound businessman, that it is a trust-worthy concern. The managers of the insurance societies invest the money paid by the clients and generally invest well. Sometimes, however, like banks, these societies fail and then all or part of your savings will also be lost.

The principle of insurance is extended to cover accidents to oneself or to one's property by fire and in travelling, so that the value of what is lost may be recovered. A young man may also insure for his children's higher education or for his daughters' marriages. By buying a premium at his child's birth he will receive, when the child is old enough to go to college, a substantial sum for that particular use. The advantage of buying a premium in a good insurance company is that a man pays out of his income a small sum which he does not even notice, while the benefits secured are greater than can be secured in any other way. A man may die after making only one annual payment, but his heirs will receive the same amount he would have paid for forty years.

USE OF SURPLUS INCOME

Savings banks perform many financial functions. A bank gives commercial, personal, mortgage and other types of loans. It receives current and fixed deposits for savings.

It also performs other duties, such as renting safe deposit boxes, issuing letters of credit and travellers' cheques and the like. A housewife who is interested in a systematic savings plan can have recourse to savings through current or fixed deposit schemes in a bank.

A man with a moderate or good income will have a surplus, that is, some money left over after meeting the needs of his family. What does he do with it? In olden times, men used to hide the extra money in secret places because of fear of robbers. Sometimes they would trust no one with their secrets, and would die without telling anyone where the money saved was hidden. Even to this day treasures that must have been buried centuries earlier are accidentally found. Articles of value—gold, jewels and ornaments, large brass or copper vessels are bought as a means of investment or storing wealth.

In modern times most people keep their surplus money in banks, or invest it in different business concerns. A bank is a business house that takes charge of people's money for them letting them draw on it at need. The directors of banks, like the managers of insurance societies, have the right to invest, that is, to lend out at interest the money thus entrusted to them. When you wish to store money in a bank, you must 'open' an account with that bank. When you put money into the bank, the amount is written in your *deposit* or *pass book*. When you wish to draw out your money, you sign a paper called a *cheque*, which is simply a request or an order to the bank to pay the amount stated therein, either to yourself or to the person named. If you are sending a cheque by post and want to make quite sure that only the person named therein shall cash it, that is, receive the money, you *cross the cheque* with two diagonal lines and write the words '& Co' between them (Figure 87). Then, it can be paid only through a person with a bank account. Sometimes two people have a joint account,

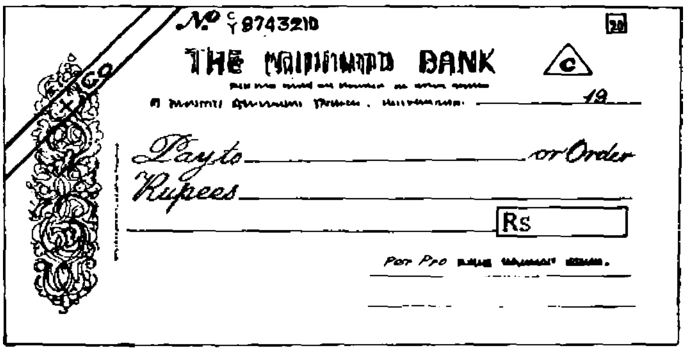


FIG. 87. Crossed Cheque

that is, they own in common the money stored in the bank. In that case they may agree that the signatures of both are necessary or that the signature of either will be sufficient.

When a man receives a cheque, he must sign his name at the back, in the same manner as it is written on the face by the person who issued the cheque, in token that he has received the money. He is then said to *endorse* it. The bank keeps all these endorsed cheques and enters the sums in the pass book, which is brought up to date every month and sent to the man who owns the account, so that he may see how he stands. Sometimes a man thinks he has more money in the bank than he actually has, and pays someone a cheque for amounts of money more than what he has to his credit in the bank at that time. He is then said to *overdraw* his account. The manager of a bank will often allow trusted clients to overdraw, charging interest on the overdrafts.

We may keep two accounts at the bank, one for current expenses, called a *current account,* on which no interest is paid by the bank. The other is for money which we do not wish to use at once, and which cannot be drawn without giving notice. This is called a *deposit* account. It brings interest.

Banks, like insurance societies, sometimes fail. The directors make speculations with the money entrusted to them and lose so heavily that they cannot go on; or sometimes a dishonest manager will rob the investors of their money. In such cases, the investors lose all or part of their money; but banks with a good reputation do not fail. Although there is some risk in banking, the system of banking is a much better way of storing one's money than that of burying it in the ground or buying ornaments.

When a bank fails, the shareholders and depositors generally receive some part of their investments or deposits. The proportion the bank is able to pay is expressed as so many paise in the rupee—50, 74 etc. People with an account at a bank pay their bills, servants' wages, rent, etc., by cheque. It is thus easy to see what payments have been made and also not run the risk of having too much cash at any time.

If people have larger sums of surplus money than they wish to keep in a bank, invest it in some business concern, on condition that so much money is being paid to them every year on each Rs. 100 that is loaned. Such business concerns are railways, tramways, motor bus lines, factories, mills and cement works. You have learnt in your lessons on arithmetic about stocks and shares and the method of buying and selling them. Nearly all the big concerns in a country are run on borrowed money, that is, money invested by those who own surplus wealth. This invested money is called *capital*, and as you already know, the money paid yearly on capital is known as *interest*. If you have money to invest do not be in a hurry. If you have in your family no man with a good knowledge of business, consult a good lawyer or a banker. But remember that some lawyers, for their own advantage, deceive wealthy people with the money they wish to invest. Even when you know that your lawyer is trustworthy, be sure that you understand the nature of the concern in which you are investing your money and judge its chances of success. You can, as the saying goes, 'watch the market' in the columns of important daily papers.

Study the business columns of the press and watch the daily changes in the buying and selling rates of, and in the interest given by, definite big concerns—mills, cement works, etc. If you can do so, buy a share in some concern as a school or a class, each member contributing so much, and make it the basis of understanding various problems in money matters.

There are different types of savings accounts. Some are:

Savings Account. Banks promote thrift by receiving small deposits. The minimum balance to be maintained is as low as Rs. 2 in some banks. A pass book is given to the savings depositor. All transactions such as deposits, withdrawals, credits of interest declared on the deposits, are promptly recorded in the pass book. Deposits may be made at any time, but interest is calculated for a minimum period of three to six months. Withdrawals are limited to one or two a week, and often restrictions are placed on the maximum amount that can be withdrawn at one time.

Withdrawals can be made by presenting the pass book and the necessary requisition for the amount to be withdrawn. Withdrawals by cheques are allowed by most banks.

Current Account. In a current account, the minimum balance to be maintained is higher. Withdrawals can be done by cheques, and a number of withdrawals can be made. The rate of interest on deposits is lower than that in a savings account.

Fixed Deposit Account. In the case of a Fixed Deposit account, the bank receives the money on deposit from the client for a fixed period. In return, it pays interest on condition the money is not withdrawn before the expiry date. This rate of interest is higher than that on current accounts or savings accounts.

Post Office Savings Bank. The Post Office Savings Bank has greatly helped the working class of people to save money. An account can be opened with as small an amount as Rs. 2. The maximum amount that a depositor can have in the Post Office Savings Bank account at any time is Rs. 15,000.

Withdrawals are allowed only once a week and the accounts to be withdrawn are also limited, but deposits can be made any number of times. The reason for this restriction is that the Post Office Savings Bank system wants to encourage savings and discourage spending.

Nidhis. The origin of the Nidhi scheme dates back to about 1850, when a fund for officials in Madras was created to save them from the moneylenders who charged very high rates of interest. The Madras officials decided to start a fund of their own which would offer needy persons with fixed incomes an opportunity to borrow at reasonable rates. Nidhis have now come to be registered under the *Indian Companies Act*. The objectives of Nidhis are to:

1. Afford facilities for saving.
2. Give relief to members from the burden of old debts.
3. Grant loans for special purposes.

The loans are given to the members and to outsiders on sufficient security at reasonable rates of interest.

Chit Funds. Chit funds are very old methods of saving and raising money. They encourage people to save according to their capacity. They provide a ready means of getting a lump-sum which can be utilised for some special purpose while payments are made in instalments. There are different varieties known as the lottery chit, the auction chit and so on.

Lottery Chit. An individual can get together a number of acquaintances or friends, who undertake to make periodic payments of specific sums for a definite period. The promoter or the organizer usually gets the first month's total collection. During the succeeding months, the names of persons contributing are written on pieces of paper and one is picked out. Thus the person to whom the chit fund is to be paid is decided by lottery every month.

Auction Chit. In an auction chit fund, the monthly collection is put up for auction among the members. The one who bids the lowest amount, in other words, one who offers highest discount is paid the fund after getting from him the necessary security to ensure his future monthly payments. The next month the successful bidder of the previous month drops out of the auction although he continues to contribute his instalments. Thus each member gets the amount once and at each auction the discount or the amount saved is divided among all the subscribing members. The last member gets the full amount.

Provident Fund. Provident fund is a type of help given by the Government to employees who save regularly. Here the employee has to save a certain amount of money in his factory or place of work from his salary every month. The Government will add the same amount of money and at the time of his retirement the total savings of the person will be paid to him with interest. Thus this is a matching grant.

Cumulative Time Deposit—C.T.D. The Cumulative Time Deposit has been set up by the Government to encourage people to save. Here the person has to save a certain amount of money every month. This money will be given back to the person with interest after a fixed period of years which can be either five, ten or twelve.

Bonus. Bonus is a sort of incentive given to workers. Here a certain percentage of the profit of a company or a factory is divided and given to the workers.

DEFICIENCY OF INCOME

While some people have a surplus every year, there are millions of people who cannot make 'both ends meet'. Such people spend beyond their income and are consequently in debt. If you ever find yourself in this state see that the situation does not continue. Cut down your expenses rigorously. Spend less on everything but food, and even in food, if you find you have been wasteful, extravagant, or buying more costly items, change your habits. Examine your accounts and your budget. Do with less household service and buy less expensive clothes. In short, do everything possible to live within your income. Save some money each year, even if it is only a few rupees. But, however careful you may be, unexpected losses or misfortunes may occur and you may find it impossible to get on for a time without help. You then look for someone who can help you. If you have a banking account and are known to the manager of your bank as dependable and businesslike, you may be allowed an overdraft at small interest. You may have to deposit at the bank some valuables, such as jewellery or an insurance policy, as *security*, until the loan is paid back, or some friend with an account in the same bank may stand *surety* for you. If you have no dealings with a bank, you can try and get an advance on your salary or Provident Fund and agree to pay back definite instalments every month. Or perhaps a friend will lend you the money on a low interest, or you can sell something of value.

One way of raising money in difficult times is to pawn goods, that is to sell them on condition that one may, if one wishes, redeem them for a certain higher price within a stated time.

Another way of raising money is by mortgaging land or property like a house which is something like pawning it. The owner keeps the property, but borrows money on it. If he does not pay back the money according to the conditions made, he has to give up the land to his creditor.

Government has also established co-operative banks which help their members in times of distress, especially during agricultural depressions.

If all these efforts fail, you may have to go to a professional moneylender. In that case, be sure to understand the terms on which the money is lent—(1) the rate of interest charged; (2) whether it is per annum or per month, and (3) the terms on which the debt is to be refunded. See that it is paid back as early as possible. All moneylenders charge high interest. Some are honest and although they charge you a high interest, they carry on their business in a straight forward way. But some are not honest. They exploit the ignorance of their debtors and keep them enslaved for years.

People are often ashamed of going to a moneylender, and in their shame and confusion often sign their names on the documents offered to them without realizing the full meaning of their contents. You must never do that. Write down the terms of agreement and study them. See exactly how much the loan is going to cost you. When you go to sign the agreement take with you a reliable man who has your interest at heart. But if you can, beware of borrowing and avoid resorting to that step. Remember: 'He who goes a-borrowing goes a-sorrowing.'

In India there is an enormous percentage of people who are indebted to moneylenders. Much of that is due to the custom of spending large sums of money on marriages, dowries, dinners and other rituals. Thousands of people spend very much more than what they can possibly afford because they do not have the courage to break a custom, which probably had its social uses in olden times, but which is now only a form of slavery. It is not really being either honest or wise or kind for a man to borrow heavily for his marriage, only perhaps to die long before the debt is paid. Many a child is born in debt A larger number inherit only debts at their fathers' deaths.

If a man's affairs are hopeless, that is, if there seems no reasonable prospect of his ever being able to clear himself and pay his debts, he may declare himself, or his creditors who are those to whom he owes money may declare him, to be bankrupt or *insolvent*. When a man is declared bankrupt, all his property, with the exception of his wife's property and certain things by means of which he earns his livelihood, may be seized by his creditors and divided amongst themselves. Sometimes his property, when sold, will pay all his debts; but more often it will not. The portion he is able to pay is expressed , as in a bank crisis, as a part of a rupee. Sometimes if creditors wish to spare a man the shame of bankruptcy, they will make a private agreement with him that he will divide all his available assets amongst the moneylenders, and in return they undertake to give him a receipt for the money owed in full. The man who does this is said to make a *composition with* his creditors. When once a man has been declared bankrupt, or has made a composition with his creditors, he is declared to be free for ever from the debts concerned. Even if he becomes wealthy again he is not legally obliged to pay, even though an honourable man will always choose to clear his debts. Sometimes a man becomes bankrupt through no fault of his own, because of war, failure of crops, illness and other causes which may ruin his business.

On the other hand, there are also many ways of enhancing the family income so as to save it from bankruptcy, subsidiary occupations which are activities which help to augment the main income help women to utilise their leisure time at home. Poultry, dairy farming, raising the kitchen garden, hand spinning, bee-keeping and embroidering are some of the leisure-time activities by which housewives can increase the family income.

THE INSTALMENT BASIS

There are many provisions to facilitate families to get some of their requirements without paying fully at one time. The cost of the article can be paid little by little in instalments in the course of a given period. For example, a sewing machine can be purchased by paying Rs. 50 at the time of purchase, and Rs. 50 every month, instead of paying Rs. 350 as down payment at one time. Some of the household equipment, furniture and the house itself are available in this way. To build a house, one can get a certain amount of money from the Co-operative Housing Society or the Life Insurance Company and repay it on an instalment basis every month.

ASSIGNMENTS

1. Visit the local markets to see (1) what commodities can be purchased there; (2) the hygienic conditions in which they are sold.
2. Visit some marketing institutions which are managed entirely by women in your neighbourhood and study them.
3. Make an inquiry into the working of any co-operative stores in your town, and see whether you would think it worthwhile to become a member there.
4. If you had Rs 5,000 surplus money, name the concern in which you would invest it, giving reasons for your choice.
5. Which commodities do you think are desirable to buy in bulk in your neighbourhood? How would you store them?
6. Suggest measures to reduce and gradually do away with the great indebtedness of India's poor.
7. Do you think it advisable to keep your money in a bank when banks may possibly fail? Explain what happens when a bank fails.
8. Describe all the (1) burdens, (2) responsibilities, (3) privileges of being a citizen of your city, town or village.

9. What public matters were discussed at the last meeting of your Panchayat or Municipality, the Legislative Assembly and Legislative Council in your state and in New Delhi?

10. What are the different ways of supplementing the family income?

11. Examine different types of account books.

12. Start keeping an account of how much you spend on items under various headings, such as school stationery, books, snacks etc. Compare the accounts of previous years. Examine different types of account books. Study the working of the Supermarkets and Co-operative stores in your neighbourhood.

13. Open an account in the bank.

14. Examine cheques, pass books and deposit books.

CHAPTER XXVI

THE WORK OF THE HOUSEHOLD

HOMEMAKING requires trained intelligence, extensive knowledge, skill, abilities and good powers of organization. Its objectives—the health, comfort and satisfaction of those who live in it—is the responsibility of the woman of the house. It is no easy matter to run a home in such a way that all these objectives are attained.

THE KINDS OF WORK THAT NEED TO BE DONE

The activities of an ordinary household can be divided under the headings of food, shelter, clothing, the care of children and health. *Food* includes its buying, storing, preserving, preparing, cooking and serving and the cleaning of food utensils. *Shelter* includes the cleaning of the house, furniture and ornaments and keeping them free from pests, trimming lamps, gardening, tending animals and seeing to household repairs. *Clothing* includes making, selecting, washing, laundering and storing clothes. *The care of children* includes feeding, bathing, cleaning their clothing and meeting all their other needs including getting them ready for school.

Health includes the effective working of all these four activities mentioned above from the hygienic point of view, besides including a study of the human body, mental health, family planning, formation of good habits, and care of invalids. It includes also the acquisition of First Aid skill which is given in times of emergency.

If all these multivarious activities are to be carried out well, the housewife must have a good plan of work. Otherwise, some tasks will be left undone and others will be badly done. We will now consider how to plan household work in terms of time and other resources, and efficiency. Just how the activities should be arranged depends on the size of the household and the amount of help that the housewife can count upon.

Homes may be divided into three types: (1) the small home, in which all the work is done by the housewife herself; (2) the middle-sized home, in which the housewife is helped by other members of the family, such as a daughter-in-law, a widowed sister, an aunt or other relatives, or servants, and (3) the large household, in which several servants are available.

Whether she does the work herself or through others, the housewife should understand how each task is done. Only then can she carry out her work effectively and sympathize with the difficulties of the workers, appreciate their abilities, and gain their respect. Workers in every department of life prefer to work for a skilled rather than an unskilled employer.

There are many aspects which should be considered in bringing about efficiency in work.

THE AMOUNT AND VARIETY OF WORK

The amount of work must be regulated not with respect to the number of members in the family, but also the number of workers available. If one woman has to carry out all the tasks, she must confine herself to simple necessities. We sometimes see a woman making herself a slave to unnecessary furniture and ornaments and overworking herself in consequence; or else we see a house overloaded with badly-kept luxuries. Bright-coloured *purdahs*, clean covers, well-polished brass or copper utensils form the natural ornaments of a simple home. If you have to do the work of your house unaided and yet possess beautiful objects, keep out only one or two at a time, and put the rest carefully away until such time as when you can have help in your work.

The work of the house may be divided into the following four main headings: Daily routine work; regular periodic work, occasional work, and extra or unforeseen work.

Daily Routine Work. Daily routine work is that which must be done daily, whatever happens, such as attending to worship and related religious duties, preparing meals, cleaning the house and its furniture, trimming lamps, tending animals and bathing and caring for children.

Regular Periodic Work. Regular periodic work is that which need not be done every day, but which occurs once a week or at other stated periods. Such work consists of a variety of tasks, such as:

Washing and ironing clothes.
Special and thorough cleaning of rooms in turn.
Putting disinfectant down drains or kerosene on pools of water.
Mending clothes.
Special polishing of metal objects or utensils.
Household repairs.

Occasional Work. Occasional work is more or less like periodic work but occurs at wider intervals. It covers such items as:

Dealing with insect pests according to seasons.
Preparing for religious ceremonies and social festivals.

Special entertainments.

Making clothes, white-washing walls, cleaning wells.

Jam-or pickle-making at the right seasons.

Renovating furniture.

Mark on your calendar the months in which you will do these special tasks.

Extra or Unforeseen Work. Extra or unforeseen work would cover the activities connected with accidents, illnesses, marriages, births and deaths, the sudden arrival of guests, or repairs needing immediate attention.

THE DIVISION OF WORK

If the housewife has helpers, she must divide the work, as far as she can, according to the tastes and abilities of her helpers. She herself probably excels in one line or more, let us say in cooking and the care of children, and will want to keep these for herself. Then she may allot house-cleaning, needlework, laundering and the care of the garden to others. Or she herself may excel in gardening and needlework, and prefer to hand over cooking to others. Or, again, she may be the wife of an official or a wealthy man who has to entertain in a large way, or she may have to add to the income by helping the business of her husband or by working at her own profession. In these cases, she will have no time for anything but the general organization of the work of her household. In whatever way she arranges it, she should make sure that each worker is responsible for his duties and takes a pride in and enjoys the work allotted to him. As children grow up, they can be assigned certain household tasks of their own. This is better for them than being merely at the beck and call of every one, although they should help anywhere when needed.

THE PLACE OF WORK

In running a house efficiently it is essential to have 'a place for everything' and to keep 'everything in its place'.

Every group of tasks should have an allotted place, where all the equipment needed for these tasks may be kept, and where the work may be performed. The housewife needs her own housekeeping corner where she keeps her small housekeeping library, a desk or writing-table in which to keep her records and at which she can sit to plan out her work and write accounts. The food work-room is the kitchen and verandah attached, and generally food equipment is kept in this room in proper places. It will help to lighten work if the equipment for sewing is also kept in the kitchen area. It will tempt us to sew if we know that our work bag or box, with thread, needles and scissors, and our embroidery frame or sewing machine or spinning wheel with all the accessories, and a chest of articles needing completion or repair, are all awaiting us in a pleasant room or verandah.

The equipment required for laundering, carpentering and household repairing, house-cleaning, and gardening, should have their particular places. A separate room can seldom be given to each of these tasks, but one corner of a verandah can be fitted with a carpenter's bench, and a cupboard with shelves containing a repair outfit, tools and glue, another corner with house-cleaning apparatus, brooms and brushes, clothes and pails, with a shelf for bottles of polishes and lamp-trimming scissors. In or near the mother's bedroom should be a cupboard, out of the reach of little fingers, containing simple household remedies, First Aid accessories and disinfectants, and another cupboard stocked with household linen. Laundry work needs its own corner, with tubs, washers, boilers, drying cords, airers, soups, soda, starch, blue stain removers, irons, ironing boards and starch bowls.

All this applies when household operations are carried out on a large scale, and whether or not the housewife has all the equipment she requires.

In considering the place of work, the question of lighting also arises. Arrange the equipment and place of work in such a way that light falls on the work and not on your eyes. Convenience in working must also be thought of. Whether standing or sitting on a chair at a table or on a stool, arrange everything within your reach. For example, while planning a morning's house-cleaning, arrange the cleaning accessories in such a manner that you have as little backward and forward movements as possible. Many workers are constantly going to different cupboards in search of the things they need for cleaning, instead of thinking beforehand and taking everything they need at one time. For such people, their 'heads will never save their legs.'

THE TIME TAKEN IN DOING WORK

A sense of time is a natural gift, but it can be cultivated by everyone. Some people, however, go through life without it. If such people happen to be housewives, you will often hear them say at night. 'I have not done half the work I had planned for today.' The reason is that having no sense of time, they planned what was impossible to carry out.

Have you ever timed yourself when you are carrying out a piece of work? It is very interesting to see just how long it really takes for each different household task. When you once have an idea of the time needed, it is much easier to plan out your work for the day or week.

The use of labour-saving devices help to save time and labour. If you have the opportunity of using them, do so. The peeler, grater, grinder, fireless cooker, pressure cooker, washing machine, electric cleaner, and similar items are all very useful, and save time and labour. If time is saved from house labour, the mother of the family has more time to be a companion to her children. She can also take more interest in civic affairs and help in many ways to spread knowledge about healthy and happy living.

Another way in which time can be saved is by doing two or more tasks together. If on a given morning you are going to do the ordinary house-cleaning, get up early, start cooking, put the clothes in to soak and prepare for your weekly wash. The clothes will be soaking while you go round the house and do the necessary daily cleaning. You can prepare food that can be cooked in a cooker such as rice, *dhal* and potatoes. This may be left on the fire until it is ready. Now you are free to devote yourself for an hour or two to your clothes. Wash them, boil or steam the white garments and hang them out to dry. This will still leave three-quarters of an hour for completing preparations for dinner. In running a house, doing two or even three things at a time is good rule. Your clothes may soak, your cooker may cook, your dough may rise while you are doing the household accounts.

THE ORDER OF WORK

Closely connected with the time taken in doing the different pieces of work is the order in which they are done. In planning the order of work, you are, in other words, making a time-table. However, the time-table of a housewife is not like that of a school or factory, for in the home the unexpected is always occurring. The good housewife will plan her work in such a way so as to be prepared at any time to change her sequence of work.

In making out her daily scheme, the housewife should not forget to allow for some periods of rest and recreation for herself, her helpers and her children. She should not forget that her time-table or scheme is her servant and not her mistress. At any time something may suddenly occur that demands all her care and time—the illness of someone in the house, or an unexpected occasion for rejoicing. For such occasions, extra help can be hired, or friends may come in and give a hand. But if they do not, some tasks must be omitted. It is more important at that moment that the ailing child is cured of fever than doing the pre-arranged task of ironing. The work schedules of no two families will be alike, as your conditions, tastes and ideals may be quite different from those of your neighbours.

Some women think that matters regarding electricity, drainage and business are too difficult for them to understand and so leave them to their husbands. This is a mistake. There is nothing in these matters that the ordinary, intelligent woman cannot understand. With a little time and attention she will be able to grasp their details. It is her duty and should be her pleasure to make herself acquainted with everything that affects the welfare of her home and family, for as the great poet Milton wrote:

> Nothing lovelier can be found
> In woman, than to study household good.

ASSIGNMENTS

1. Plan out a week's work for the first week of the monthfor a housewife whose family consists of three adults and four children. Only one adult can assist her.
2. Plan out an ordinary day's work for your three helpers if you were the mistress of a large household and obliged to entertain a good deal.
3. Make a time chart for a day.
4. Write down the different ways in which time is wasted in an ordinary household.
5. What preparations would you make for taking a large family from your town to New Delhi?
6. Time yourself in doing different tasks at home and make a record of them.
7. Give as many examples as possible to show that time may be saved by doing more than one task at a time. Suggest improvements.
8. List the necessary qualifications of a good housewife.

CHAPTER XXVII

FIBRES AND THEIR MANUFACTURE INTO CLOTH

Articles required: Fibres of cotton, silk, flax, wool, hair, rayon and other synthetic fibres, ramie, china grass, coconut fibre, hemp, jute, specimens of yarn and cloth, implements for ginning, spinning, cleaning and weaving cotton.

WHAT is a fibre? A fibre is a thread-like structure. Some fibres can be spun into thread which can be woven into cloth. The fibres used in weaving cloth for making clothes, for cleaning or decorating houses or in rendering them comfortable are those of cotton, linen, silk, wool, hair, ramie, china grass, hemp, jute, the lining of coconut shell, gold and silver or tinsel thread, asbestos and several synthetic fibres.

Cotton, which is well known to us, is a white or yellow-white vegetable fibre. The chief cotton-growing countries are the United States of America, U.S.S.R., Uganda, Cyprus, China, Brazil, Egypt, Peru and India. From sixty to one hundred and ten days after planting, the plant produces beautiful, creamy-white blossoms, which change to pink or red, fall off after a day or two, and are replaced by small, green three, four or five triangular pods called *bolls.* When the ovary ripens, a large pod known as the cotton boll is formed. During the next fifty-five to eighty days the bolls mature, that is, the seeds and fibres develop within the boll, which increases in size to about that of a walnut. The seed hair, which begins to grow on the day the blossom appears, reaches a maximum length of two to two-and-half inches, in long-fibre varieties, and is known as lint.

The mature boll bursts open due to the internal fibre pressure, exposing the fluffy mass of white cotton fibres, each section of which contains seven to ten seeds embedded within. Fibres in the different adjacent cells are also found to intertwine to a considerable degree.

Fibre is a vegetable growth found attached to the seed and closely packed with others inside the boll, the seed vessel (Figure 88)of the cotton plant,

FIG. 88. Cotton bolls

There are several kinds of cotton plants, from the cotton herb which is a very small plant with a soft stem that does not last for a year, to the cotton tree of South America, growing as tall as five metres.

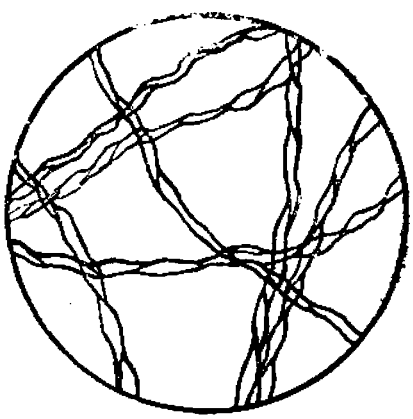


FIG. 89. Cotton fibre (x 100)

Examine some raw Indian cotton as it comes direct from the boll. It is made up of a mass of very fine fibres, the length of which may vary from two to two-and-a-half centimetres. The fibres of the best American cotton vary in length from four to six centimetres. Under the microscope, the cotton fibre (Figure 89) appears flat, like a ribbon and slightly thickened at the edges; it has a natural twist in it, which enables the fibres to hold easily to one another when spun. Otherwise, being so short, the fibres would tend to come out from the cloth.

Linen is another vegetable fibre. It comes from the *bast* which is the inner layer of the stem of the flax plant. This plant is grown in India, chiefly for the sake of its seed, from which the valuable linseed oil is made. The chief producers of flax are the U. S. S. R., Ireland, Belgium, Holland, France, Italy and Egypt. The best fibres come from Belgium and Holland, but Irish linen is also highly prized. The linen fibre is usually about fifty centimetres in length, but may be even as much as ninety centimetres. It has no twist in it, but has occasional little cross lines which look like joints as shown in Figure 90.

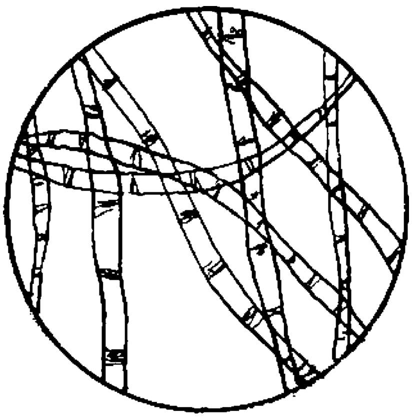


FIG. 90. Linen fibre (x 100)

Silk is an animal fibre (Figure 91) obtained from a certain type of insect. It is produced by the caterpillar or *silkworm* of a whitish-coloured moth.

History records that the Chinese were the first people who knew how to raise silkworms and manufacture silk. There are two varieties of silk—the *wild* and the *cultivated.* The wild silkworm feeds on scrub oak, and the cultivated silkworm on mulberry leaves.

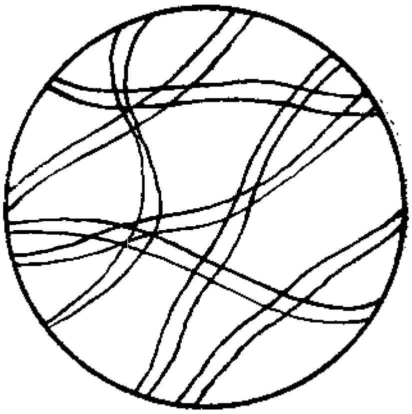


FIG. 91. Silk fibre (x 100)

Silkworms have a short life span of only about two months. During that period they pass through four stages of development which are:

1. Egg
2. Worm (grip)
3. Chrysalis (pupa) or cocoon
4. Moth (perfect moth). The life cycle of the silkworm is shown in Figure 92.

A tiny white worm about six to seven centimetres long hatches from each egg. These worms called *caterpillars* are very delicate and require the utmost care. They feed on mulberry leaves or the leaves of the castor oil plant in the plains. During this stage they shed their skin four times. At the end of thirty days, the worm ceases to eat, seeks some support on which it can suspend itself, attaches itself to a piece of straw, begins to spin its cocoon and enters the *chrysalis* stage. From two tiny holes in its mouth two filaments are ejected, one an almost invisible silk filament and the other a glutinous gummy substance which covers the silk. The filaments merge and harden into one thread when exposed to the air. Having fastened itself to its support, the worm covers itself all over with the

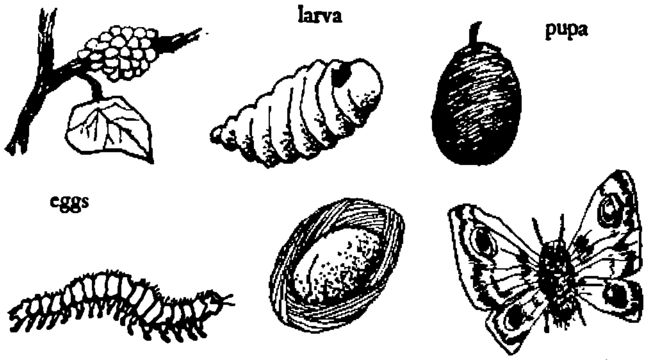


FIG. 92. *Life cycle of the silkworm*

silk filaments. To do this it turns its head round in the form of a continuous figure 8 and cleverly jerks the thread just where it wants it to go. Watch it at work in the early stages until it has covered itself with silk. While this is being done, it continues to spin silk inside its silken covering from within its body and throwing it round itself. As it cannot eat, it naturally grows smaller and smaller until at last, after about three days, it has spun up all the material it has and the *cocoon* is completed. Then it goes to sleep for three weeks, at the end of which time it becomes a perfect moth, which, if allowed, will eat its way out of the silken nest it has made.

If the moth is permitted to emerge from the cocoon, the silk filament is broken into many short pieces. Therefore, the chrysalis is steamed or subjected to hot air to kill the *larva* inside the cocoon. Long thin fibres can then be reeled from the unpierced cocoons.

Three days after they are hatched, the moths mate, lay eggs and die. Their cycle of life is thus completed.

The silk fibre spun by the caterpillar is from 270 to 1,300 metres long. In appearance it is smooth, with occasional little leaf—like deposits of gum on its surface.

Wool is another animal fibre which is obtained from the thickly matted fleece that grows on the back of sheep. It is in many ways like hair. The wool of sheep and goats is made up of excellent fibres. The fibre varies in length from five to forty-five centimetres and also varies greatly in fineness. On the whole, the Saxony and Silesian wools are the best in quality.

Wool fibres (Figure 93) are covered with minute scales, which cling to each other and enable the short fibres to be spun into thread. They have yet another use that will be discussed later.

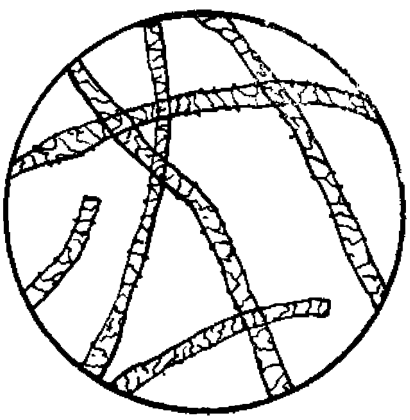


FIG. 93. Wool fibre (x 100)

Pashmina of Kashmir. The Pashmina shawls of Kashmir are made of the best quality wool. The *Pashm* or wool is obtained from the hair of the ibex and can be woven into the softest of woollen fabrics. A high-class shawl is expected to have the design worked evenly on both sides, and may take about a couple of months to complete.

Hair is the natural covering of many animals. A coarse cloth is woven from the long hair of the horse's tail, camel's hair and the shorter hairs from some other animals are used with wool in the manufacture of cheap blankets and rugs.

Ramie, when prepared, is known as *china grass*. It resembles linen and like linen is a fibre from the bast of the stalk of a plant. It is grown in India, China and Japan, and also in the U.S.A., and France. Fine household articles, like table cloths, are made from this fibre.

Hemp is the name given to a fibre procured from the bast of several plants. Hemp fibre makes strong ropes and cables. It is used also to make coarse, heavy cloth, such as sails for ships.

Jute is a fibre coming from a plant belonging to the *lime* tree family. It is very coarse and is used for making gunny sacks and certain types of rugs and carpets. Much jute comes from West Bengal.

Coconut Fibre is found lining the outer shell of the coconut. It is used for making coir and coarse matting.

Gold and Silver Thread and Tinsel. Tinsel is the name given to any bright metal beaten and cut into threads. Gold and silver thread and tinsel are woven with silk or other fibres into cloth. The famous Banaras gold brocade saris are good examples.

Asbestos is a rock found in some parts of Europe and U.S.A., which, when crushed, does not crumble into powder but splits into fibres that can be woven with cotton fibres into cloth. The cotton is burnt away, leaving a non-inflammable cloth which is used as fire-proof material.

SYNTHETIC FIBRES

Rayon is made from wood pulp and other forms of cellulose which is the scientific name given to the substance that forms the framework of plants. The pulp is treated with chemicals and then passed through capillary tubes to the required length. The fibre thus formed looks like silk. Therefore the term 'artificial silk' is often used for rayon.

Nylon. Nylon was the original brand name coined by the Dupont Company in the U.S.A., for a fibre born as a result of a research study on Polymerization begun by Dupont in 1928. Nylon fibre is formed as a result of a combination of adipic acid and hexamethylene diamine. Like protein fibres nylon is composed of carbon, hydrogen, oxygen and nitrogen, but it is not made up of amino acids. Therefore its properties are not like those of protein substances. Nylon is a lustrous, white fibre, which is transparent or translucent. It can be made in varying diameters, lengths, degrees of strength, abrasion resistance, and lustre. Nylon remains unaffected by dry cleaning solvents. Nylon fibre was first used for parachutes and although its sale was announced to the consumer on October 30, 1938, it was not available to the public until a year later and then only in limited quantities. It was not until after World War II that civilians could again purchase nylon.

Compared to other fibres nylon is unsuitable for both summer and winter. In summer, nylon does not absorb heat and therefore people feel hot in nylon clothes. In winter, it does not protect the body from outside atmosphere. Furthermore, it is dangerous to work in laboratories and kitchens with nylon clothes because improperly processed and finished nylon easily catches fire.

Since some nylons are transparent, they cannot be worn or used, unless they are lined. Ultimately, the scope for nylon for the purposes of clothing becomes limited.

The family of *Acrylonitrile* fibres at present has five members—Orlon, Acrilan, Creslan, Zefran, and Courtelle.

Orlon is the result of research on polymerization of acrylonitriles. It does not require heat-setting to obtain dimensional stability and wrinkle-resistance, but may be heat-set for durable pleats or creases.

Orlon is widely used for dresses, blouses, suits and coats, though the manufacture of Orlon sweaters and jersey fabrics has been quite successful as well.

Acrilan is a co-polymer of acrylonitrile and vinyl acetate, although some other substances may replace a part of the latter material. Acrilan can be more readily dyed than Orlon. It is bright in colour, but can also be bleached white. However, light exposure and heat tend to cause changes in colour. Acrilan does not ignite readily. It is popular for blankets and for knitted goods such as sweaters, jerseys and permanently pleated fabrics.

Creslan is also a co-polymer of acrylonitrile with small amounts of acrylamide. The spinning is a wet spinning process with coagulation taking place in a frigid bath. Sweaters and other knitted goods, fur-like fabrics, blankets and other items for which bulk, warmth and light weight are desirable are the fields of use for this fibre. Use Creslan for rain-wear, suits, jackets, dresses and children's outfits.

Zefran is composed of acrylonitrile and limited amounts of other substances. It can be heat-set and is said not to 'pill'. It is soft, warm, comfortable and drapable.

Courtelle is said to be wool-like and very much like Acrilan in nearly all its properties. However, it does not dye as readily as Acrilan. Courtelle can be used for knitted garments such as sweaters, underwear and jersey fabrics.

Dacron is a polyester fibre manufactured from ethylene, glycol and terephthalic acid. In producing Dacron. ethylene, glycol and terephthalic acid and probably a catalyst are placed in vacuum kettles and polymerized at high temperatures. Wicking is a property that makes Dacron comfortable to wear in hot weather. Dacron has been widely accepted for the purposes of apparel, textile furnishings and for industrial uses.

Fibre Glass is the trade mark of the glass fibre produced by the Owens-Corning Fibre Glass Corporation. It is the glass fibre most widely used for textile purposes. Textile glass fibres are used largely for lovely and translucent drapery fabrics such as curtains and to some extent for table cloths, lamp shades, fire-proof mattresses and ironing-board covers. They are not suitable for wearing apparel because the fibre tends to irritate human skin.

Of all these fibres, cotton, linen, silk and wool are the most widely used and liked for clothing.

ASSIGNMENTS

1. Open the stems of different plants and examine their fibres.
2. Examine fibres of cotton, silk, linen, rayon and wool under the microscope. Sketch and discuss the differences between them.
3. Classify fibres into different categories giving reasons.
4. Observe ihe materials of which clothes are made in your locality. What is most popular?
5. Collect samples of different fibres and make an album.

CHAPTER XXVIII

THE QUALITIES AND USES OF DIFFERENT CLOTHS

WE buy cloth for utility and beauty. The qualities which determine their usefulness are many, such as strength, durability and warmth (or coolness), the labour involved in their washing and their dirt-resisting and non-absorptive and absorptive properties. The qualities which determine beauty in a fibre are smoothness, softness, glossiness, fineness and an affinity to beautiful and delicate shades of dyes.

Silk is the most beautiful of all fabrics; it possesses all the qualities of beauty named above. It is also very useful, being strong, durable, warm and dirt-resistant. It also washes well and is used chiefly for clothing in our country and, with growing popularity, for furnishings in the West although it is costly.

In a lesser degree *linen* possesses the many beautiful qualities of silk but it has not the same affinity to colour. It is the strongest of all fabrics, and has a natural firmness that cannot be found in any other. It washes very well and is very absorbent, for which reason it makes the best towels for toilet and household purposes. It is very cool to the touch and is used for items such as table covers, bed sheets, wiping cloths as well as clothing.

Wool has a beauty of its own, but cannot be compared to silk, except in softness. It dyes well. The chief characteristic of wool is its warmth combined with lightness, which makes it by far the best item for winter clothing. However, it does not wash well, unless special care is given.

Cotton is not as warm as wool or silk, cool, strong and absorbent as linen, nor beautiful and dirt-resistant as silk, but in spite of all these handicaps it is one of the most useful fabrics. It can be easily and excellently washed and absorbs moisture well, though it does not dye as well as the other fabrics. It can be used for all household purposes and clothes of all kinds, particularly for tropical countries like our own. Cotton is the least expensive of the fabrics we manufacture. When spun fine and woven and dyed well, it can look very attractive. It has a distinctive beauty of its own, the Dacca muslins and *mulmulls* being fine examples.

Nylon is very durable because it is strong, elastic and resistant to abrasion. It is also resistant to moths, insects and other organisms as well as mildew. Hence storage problems with regard to nylon are almost nil. This synthetic material, however, melts but does not burn, except when it comes in contact with a naked flame. In addition it does not absorb moisture nor does it permit ventilation and is therefore an unsuitable fabric for clothing.

ADULTERATION OF CLOTH

All the cloth we buy is not what it claims to be. Sometimes cloth is mixed with inferior material and labelled as some other fabric. It is then said to be *adulterated.* The better fibres—wool, silk and linen—are all liable to be adulterated with cotton, silk with linen and wool with shredded fibres of old woollen cloth. All these are now adulterated with synthetic fibres also. Cloth from the shredded fibres of old woollen cloth is called *shoddy*. The inferior fibres which are called *foreign* fibres may be combed in with the fibre to be adulterated, or they may be twisted in when spun, or used as either warp or woof in weaving.

It is legitimate to mix fibres for the purpose of producing a less costly or, sometimes, a stronger material, and to sell the products as *mixed goods* at a lower price. But often the manufacturers and dealers demand a high price for an inferior or adulterated cloth, branding it as superior.

BUYING AND TESTING CLOTH

As a considerable part of one's income is spent on cloth for personal and household use, the housewife needs to understand the actual value of the piece of material she wants to buy, as well as the qualities of various fibres and the uses of different clothes made from each. She must know whether or not the fabric selected is (1) likely to wear well; (2) has been dressed, weighted and calendered to make it appear better than it really is; (3) is liable to shrink with washing; (4) is colour fast and (5) whether or not it has been adulterated. Only on the basis of such knowledge will the housewife be able to spend her money wisely on clothing. When buying cloth, she should be able to carry out some suitable tests. For this purpose, she should take a sample of the cloth she is considering for purchase and test it in the following ways.

Strength and Durability. A practised buyer can assess cloth from its look and 'feel'. The cloth may be pulled in all directions to see whether or not the woven threads move easily from their places. Close, firm, even weaves wear better than loose, irregular ones. Again, a few strands from both warp and woof should be unravelled and tested for strength. If they are not easy to break the cloth will probably wear well. Hold the cloth up to the light and notice the closeness and regularity of the weave.

Shrinking. Measure the length and breadth of a small square piece of the cloth to be tested. Wash and iron it in the ordinary way and measure it carefully in the same way again. If the two measurements are found to be the same, no shrinkage has occurred.

Fastness of Colour. Cut out three pieces of the cloth to be tested. Keep one piece aside, as the 'original' for comparison. Wash the second piece in hot soapsuds and iron in the ordinary way, and expose the third to strong sunlight for a week. Compare the second and third with the original for colour fastness.

Sizing and Weighting. Tear rapidly a piece of the material to be tested. If much dressing has been used, it will fly out in a powder. Alternatively, soak in water and look for any sediment.

ADULTERATION OR SUBSTITUTION

Wool or Silk with Cotton. Examine the fibres using a magnifying glass. Cotton fibres are straight and dull; wool fibres are curly and more lustrous while silk fibres are glossy.

Pick out separate fibres and burn them. Wool and silk burn with difficulty, giving out a disagreeable smell, like that of burnt hair. Cotton, being cellulose, burns very easily. Place a small piece of pure cotton cloth, a small piece of pure woollen cloth, and a small piece of silk cloth in a flame and note the difference. Do the same with *mixed cloth*.

Make a solution by dissolving one ounce of caustic soda or caustic potash in a pint of hot water. Boil in it small pieces of cloth made of cotton, wool, silk, wool mixed with cotton, and silk mixed with cotton. The wool and silk containing nitrogen will be dissolved within fifteen minutes (the nitrogen undergoing a chemical change), while the cotton will remain practically unaffected. In these tests linen is affected in the same way as cotton, but linen is not used as often for adulteration, being more costly and rare.

New Wool and Shoddy. Shoddy fibres are generally much shorter than the fibres of the new wool, and are of different lengths and thicknesses. Under the microscope shoddy fibres are seen to be worn out and damaged and sometimes of a different colour.

EXPERIMENTS

New Wool and Shoddy. 1. Examine the fibres suspected of adulteration under a microscope or a powerful magnifying glass.

2. Tear a small piece of cloth; cloth made from shoddy is much weaker than that made from new wool.

Linen and Cotton. 3. Hold up linen and cotton cloth to the light. Linen threads in warp and woof are always more uneven than cotton threads.

4. Drop some water on linen and cotton cloth. Linen absorbs water more rapidly.

5. Drop oil or glycerine on linen and cotton cloth and hold the cloth up to the light. Linen, if free from dressing, looks more transparent than cotton.

Silk and Rayon. 6. Examine silk by sight and touch. The lustre and feel of pure silk is softer than that of rayon.

7. Burn some fibres. Those of rayon, being made of vegetable matter, burn rapidly and smell like burnt paper. Real silk, when burnt, smells like burnt hair or burnt feathers.

8. Wet some silk and rayon. Many varieties of the latter become weak in water so that any pressing or rubbing results in a hole.

9. In a caustic potash solution place pure white silk and white rayon. The former will remain unchanged in colour while the latter will turn yellow.

Assignments

1. Name and describe fabrics other than woven ones.
2. What qualities in a fibre determine (1) its beauty, (2) its usefulness?
3. Test cloth of different kinds for strength, durability, shrinkage, colour and sizing. Record what you observe.
4. How would you distinguish between (1) pure silk and artificial silk? (2) pure wool and wool mixed with cotton? (3) linen and cotton? By boiling with acids and alkalis and burning, test pure and mixed cloths.
5. Make an album of different kinds of textiles available.
6. Compare silk, linen, wool and cotton with regard to (1) beauty, (2) usefulness.
7. What points will you remember when purchasing cloth?

CHAPTER XXIX

LAUNDRY WORK

Articles required : Cleaning equipment and agents, pieces of cloth and garments made out of different fibres.

IT is almost as necessary to wear clean clothes as to have a clean skin. Soiled clothes, besides being unpleasant, may harbour micro-organisms and when the air spaces in its meshes are choked with dust and dirt, cloth can no longer absorb moisture from the skin. Laundry work is one of the heavy tasks of the housewife, especially when she has a large family and cannot afford a *dhobi*. Even for the well-to-do families it has become necessary to avoid *dhobis* because of their very rough and inhygienic handling of clothes. The housewife's work may be lightened by using the suitable equipment and materials discussed in this chapter.

EQUIPMENT

If possible, a room or a part of a verandah should be kept for the work of washing. To equip this room or corner the housewife needs:

A *stove* for heating water, boiling or steaming clothes and heating irons.

Three *tubs* made of galvanized iron, plastic or polythene. One is required for suds and the other two are kept for rinsing. They should be placed on a bench at a height which is convenient for the worker to wash without stooping.

A *rubbing surface*, generally a rather rough stone fixed in a slanting position. A better arrangement could be made by having a corrugated surface made of cement,

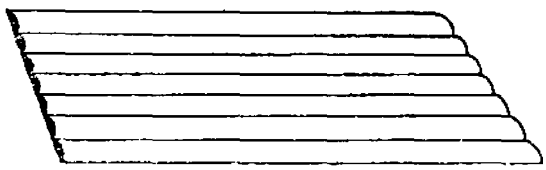


FIG. 94. Galvanized surface for rubbing

wood or galvanized iron sheet (Figure 94). A tap should be placed over the surface. Sometimes a wooden board fitted with strips of wood is used instead of a stone.

A *boiler*, which is generally made of copper, because copper transmits heat very quickly. It should be fitted with a tap near the bottom to draw water.

A bamboo or any other rust-resistant *frame* or *rack* for clothes to be placed in the water while steaming.

Some *wooden sticks* to stir and lift the clothes out of the water.

One or two *pails*, *basins* and *jugs*.

Soap *dishes*.

A *kettle* or *degshi*.

Spoons for mixing starch and blue.

Little cotton *bags* for blue and starch.

A *washer*. There are several varieties of washers in the market (Figure 95). All aim at forcing soapy water through the clothes and thus forcing the dirt out. A washer may be worked by hand or any other power. The use of a washer does away with the need for rubbing or beating clothes during washing.

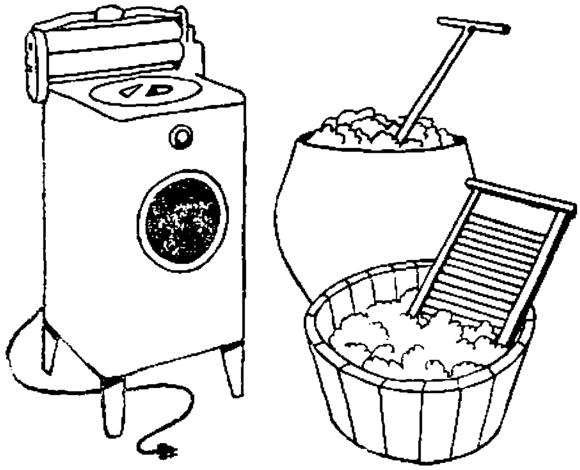


FIG. 95. Types of washers

A *brush* for scrubbing obstinate marks.

FIG. 96. Skirt Board

A *wringer* is useful to wring water out of the washed clothes. A *mangle* works like a wringer. It presses cloth flat and saves ironing in the case of sheets, towels and *saris*.

A *table* for ironing.

A *blanket* and *white cloth* for padding the ironing table.

Ironing boards for skirts and sleeves (Figure 96). These are useful to slip into any circular garment. They should be rested on two trestles on the main ironing board or table or other firm supports, and be covered first with felt or a blanket and then with white unbleached cloth.

A large *bamboo frame*, for drying clothes over a *sigri* in the monsoon.

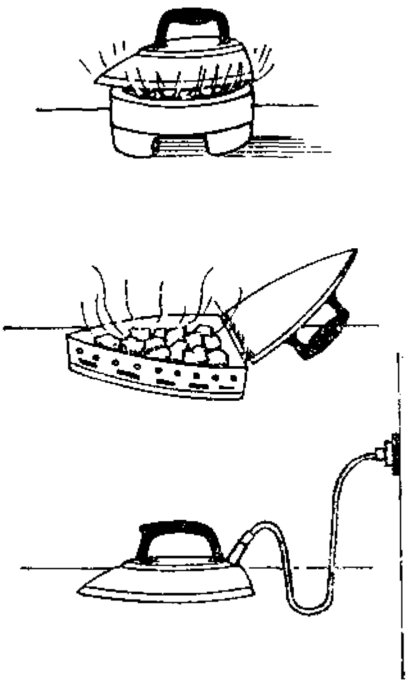


FIG. 97. Irons heated in different ways

Two or three *baskets*.

A rope, called a *clothes-line*, on which to hang clothes to dry.

Clothes - props for raising the clothes-line. They should be forked at one end.

Clothes - pegs for fastening clothes to the line. These are available in wood or plastic.

Irons for smoothening clothes. Irons may be heated by being filled with heated charcoal and placed on the fire, or by electricity (Figure 97). Steaming irons are also available, in which a space is specially provided to let out water on to clothes, which is converted into steam when the clothes are pressed.

An *iron stand* and *holder*. A sheet of asbestos makes a good iron stand.

Cloth for rubbing and cleaning the irons.

Glass-stoppered bottles in which to keep various cleaning and stain-removing agents.

A *dropper*.

A *glass rod*.

A *cupboard* for storing laundry equipment.

CARE OF LAUNDRY EQUIPMENT

All laundry equipment should be kept scrupulously clean. Irons are liable to get damp and rusty in the monsoon, or at any time when there is plenty of moisture in the air. Rust soon eats into the surface of the iron and destroys its smoothness. Keep irons in a warm dry place, and, if they are not used for some time, rub them with grease and wrap them in paper. If they are dirty, rub on common salt and clean off before you grease. Copper and other boilers, zinc tubs and pails must be cleaned after use, wiped and kept dry. Baskets, airers, pegs and sticks must be brushed or wiped before use.

Wringers and mangles must be loosened after use. The machinery should be kept well oiled, the rollers well dried and covered with a cloth.

Washers, if made of wood, need little care if they are kept dry.

Metallic washers get covered with scum. This can be wiped off each time from simple washers, but in the more complicated ones, the scum chokes the inner holes and passages and has to be dissolved with acids every month or so. However, washers are usually not needed in small households.

CONTENTS OF THE LAUNDRY CUPBOARD

STAIN REMOVAL	WASHING	DRYING	IRONING	MENDING	OTHERS
Alcohol	Soap-flakes	Ropes	Irons	Cotton thread	Marking ink
Benzine	Soap-bars	Clothes-pegs	Beeswax	Other threads	
Petrol	Soap-nuts	Boards for woollies	Iron holders	Needles	
Kerosene	Detergents		Iron stands		
Olive oil	Washing soda		Sleeve ironing boards		
Turpentine	Boric powder				
Chalk	Salt				
Chloride of lime	Vinegar				
Javelle water	Starch				
Bowls	Blue				
Droppers	Gum Arabic				
Small glass rods	Boards for scrubbing				
	Sticks for stirring				
	Boilers, Tubs, Pails				

WASHING AND CLEANING AGENTS

The numerous articles required for laundry work are given in the table *Contents of the Laundry Cupboard.*

Water dissolves several kinds of dirt, and when in motion carries away particles of dirt. It can be used, when cold, for soaking clothes and loosening dirt; when hot, for washing clothes and dissolving grease; and when boiling, for purifying and disinfecting clothes. It can also be used in the form of steam, when it has the same effect as boiling water. Steaming involves less labour and is more economical. Steam also removes some stains.

Boiling water which is *hard*, owing to the presence of lime, results in a deposit of lime on the sides of the vessel in which it is boiled.

Washing soda (sodium carbonate) is used to soften permanently hard water. Only enough soda should be put into the water to soften it, and no more. When soap lathers easily in it, the water can be considered soft. Soda has many cleansing effects but damages soft fabrics and is bad for the hands though it is relatively less costly.

Soap is made by mixing fat and an alkali. Its characteristic is that it readily forms an emulsion with soft water. Soap has great cleansing and disinfecting qualities. The alkali in it dissolves the grease which is generally mixed with dirt.

Detergents. When used for laundering in hard water soap leaves a soap curd on fabrics which is difficult to rinse out. In places where it is expensive to correct water hardness, synthetic detergents such as '*Det*' and '*Surf*' can be used instead of soap. These work satisfactorily and can be rinsed more easily than soap.

Borax and ammonia are alkalis which have the same softening and cleansing effects as soda, but are harmless. They are, however, more expensive.

Alcohol dissolves grease.

Kerosene dissolves grease and loosens dirt. It is often mixed in laundry soaps, and is sometimes put in small quantities into the water used for boiling clothes.

Benzine and *petrol* dissolve grease rapidly and are used for taking out greasy stains. Kerosene, benzine and petrol, especially the last two, should be stored carefully and should never be used near a naked flame since they are highly inflammable. They are best used out of doors in the day time.

Potassium permanganate is used for removing stains from white cloth.

Acetic acid, which is found in vinegar, is used to set the colour when washing coloured clothes. It also removes weak stains.

Lemon juice and *citric acid* prepared from lemon juice and the juices of other acid fruits, and oxalic acid prepared from various plants, are used for removing many kinds of stains.

Care must be taken to keep acids in clearly labelled bottles with glass stoppers, as acids destroy corks. All acids and alkalis tend to destroy colours.

Bicarbonate of soda, cream of tartar and *salt* help to remove some stains. Salt sets colours.

Oils such as olive oil and turpentine remove certain stains.

Chalk, Fuller's earth, dry starch and *blotting paper* absorb grease and some stains.

Chloride of lime is a strong alkali. It removes stains but also bleaches clothes.

Javelle water removes stains from white fabrics. To make Javelle water, dissolve 500 g. washing soda in a litre of boiling water. Mix 200 g. of chloride of lime in 2 litres of cold water. Leave the lime to settle. Pour the clear water into the dissolved soda and water and bottle it. Use this solution for white cotton linen clothes only. Always remember to wash out quickly with clean water.

LAUNDRY ACCESSORIES

Starch is used to stiffen washed cloth. It is found in tiny grains in certain plant foods such as rice, wheat, tapioca, maize and potato. The grains burst in boiling water and combine with the water to form a jelly-like mass, which may be thinned by the addition of more boiling water. For stiff starching, maize or wheat starch is used. A small quantity of wax is sometimes added. For ordinary clear starching, rice is the best.

Recipe for Clear or Hot Water Starch:

1 tablespoonful of commercial starch
3 tablespoonfuls of cold water
1 teaspoonful of borax (gives a gloss to clothes)
A shaving of white wax (candle wax is good)
Boiling water.

Mix the raw starch with the cold water until free from lumps. Then scatter in borax and wax and mix well. Pour on absolutely boiling water, stirring all the time until the starch becomes thick and clear.

Rice starch, which is suitable for all ordinary household purposes, is made as follows. Put 5 tablespoons of rice into 2 litres of water. Boil slowly, adding water when necessary, until the rice becomes a pulp, that is, a soft formless mass. Add two litres of boiling water and strain through a bag. Tapioca may be substituted for rice.

Gum Arabic diluted with water (1 tablespoonful to ½ litre) can be used in place of starch, especially for silks.

Blue is used to give a good colour to washed clothes. It was originally, and still is sometimes, obtained from the indigo plant. Now it is mostly manufactured artificially from coal tar products and generally sold in the form of a block. In order to make an uniform solution it is tied into a little bag and squeezed in the water.

FABRICS TO BE WASHED

The different cleansing agents and processes have different effects on fibres. The animal fibres—wool and silk—are more delicate than those of vegetable origin, namely, cotton and linen. Heat, whether from hot water or irons, sunshine or fire, damages wool and silk, which scorch easily. Heat stiffens silk and causes it to crack. It makes the projecting scales of the wool fibre to interlock, thus thickening and shrinking the fabric causing it to *felt*. Sudden changes of temperature have the same effect. Cotton and linen are unaffected by boiling and may be ironed by a much hotter iron than wool and silk. Rayon or artificial silk is more easily affected than real silk. Heat also turns white silk yellow.

Rubbing causes wool to felt, and is apt to break the silk fibre. A reasonable amount of rubbing does not injure linen and cotton cloth.

Water causes wool to felt and rayon to dissolve. Water often causes colour to run.

Pressing too heavily with an iron causes stiff materials, such as stiffened silk and linen, to crack along the folds.

Alkalis have a weakening effect on all fibres. Of all the alkalis usually employed, ammonia and borax do the least harm and chloride of lime the most. Soda in the washing water turns wool and silk yellow. Alkalis remove colour, and have a worse effect on linen than on cotton.

Acids weaken all fibres, but if diluted well their weakening effect on wool is rather less than on other fibres. In the case of wool and silk they first roughen them. When used for the removal of stains, acids should be washed out quickly. Long contact will wear a hole in the material. That is why the acids in perspiration weaken cloth. Therefore garments should be washed frequently. Acids also remove colour.

Soap, if it contains *free alkali*, will have the same effect as an alkali. Good, pure soaps have no ill-effects on fibres. For wool and silk, a soap solution should be made in which the clothes may be *soused*, that is, kept in motion but not rubbed. One of the following methods can be adopted for making a soap solution for woollens.

1. Shred and dissolve a cake of good laundry soap in 4 litres of water. Add 1 tablespoonful of borax or more if clothes are very soiled.

2. Shred 120 g. of good laundry soap to ½ litre of boiling water. Small scraps may be economically used up. Put into a pan or jar with the water. Heat slowly to prevent its boiling over. This solution can be used for making a permanent lather for all types of cleaning. It is very suitable for washing silk and wool when rubbing must be avoided.

Oils and Spirits. Turpentine, alcohol, benzine, kerosene and petrol have no ill-effects on cloth. Clothes treated in them should be exposed to fresh air to remove the smell.

The various steps in washing the family clothing are given in the following pages.

SORTING OF CLOTHES

The first step in washing is to collect the articles to be washed, sorting them into appropriate groups, locating those requiring attention, as with stains which have to be removed. The groups are arranged according to fibres and colours as follows:

1. Woollen articles } white, light fast
2. Silk articles } coloured dark fast
3. Rayon articles } coloured.
4. Cotton and linen articles
5. Coloured articles of all fibres which are likely to run and so have to be washed separately.
6. Fine fabrics including table linen.
7. Bed and household linen, under linen and other cotton articles, white and fast coloured (light and dark).
8. Clothes used and clothes worn during the process of cooking and cleaning.

Sort out all articles needing mending. All garments and household articles such as curtains and sheets should be mended before washing. Clothes worn next to the skin and soiled household clothes, such as dusters and washing-up cloths, should be mended after being washed.

Sort out all stained garments. No garment should be thrown into the wash tub until stains have been removed. Many stains are *set*, in other words made permanent, by the ordinary process of washing. Moreover, it is very troublesome to search for them and give them special attention when they are in the water with other wet clothes.

REMOVAL OF STAINS

Successful removal of stains from fabrics depends on the basic principle of not allowing the spot or stain to become set. A stain should be removed at the first possible opportunity because it may be more easily dissolved when fresh. Different fibres require different methods and different stain removers. The use of an incorrect remover may damage or even destroy the fibre of the material. A knowledge of the nature of the stain makes possible the immediate use of the appropriate method of removal. Hot water should never be used on an unknown stain. The heat will set the stain making it more difficult to remove. If the stain is known to be of a non-greasy nature sponging with cold water may be all that is necessary. On the other hand, a greasy stain requires the use of carbon tetra chloride or some other dry cleaner such as benzine, gasoline, turpentine etc. There are four effective methods for removing spots and stains.

1. *Dipping* is the best method because the entire fabric can be immersed in the stain remover. This is the most convenient method if the spot is large or if there are many spots on a cotton or linen fabric.

2. Stains on wool, silk and orange-coloured fabrics may be removed by *steaming*. The stained area is saturated with steam by spreading the cloth over a bowl partly filled with hot water in which a small amount of the appropriate removal agent has been placed.

3. In the *drop method* small drops of a removal agent

can be applied by means of a medicine dropper, glass rod or orange stick.

4. *Sponging* is the most frequently used method of stain removal, but if it is not done with care it will not be effective. An absorbent cloth or a blotter should be placed underneath the stain to absorb the removal agent as well as the stain.

Many synthetic fibres such as orlon, acrilan, dynel, creslan and dacron are not very absorbent. Such fabrics do not stain. The removal of stains generally means merely wiping with a damp cloth or washing with a mild soap in warm water.

Stains, according to their nature, may be simply removed by the action of water forced through the cloth, dissolved, changed chemically such as acids by alkalis and the reverse, or absorbed by powder or blotting paper as in the case of grease.

To apply acid, use a medicine dropper or a glass rod, and drop one drop at a time on the cloth stretched over a bowl of boiling water. If rubbing is necessary, use a glass rod. Do not keep acid on a fabric for a long time. Dip the cloth into water and apply acid again if necessary. Rinse out with cold water to which a little ammonia has been added. Use Javelle water in the same way. Use oxalic acid, which is very poisonous, only for very obstinate stains.

Remember that even diluted alkalis damage silk and wool, that acids and alkalis, though they both remove colour, concentrated acids and alkalis also quickly destroy all cloth.

When stains on coloured garments cannot be removed by simple washing or by being dissolved or by being absorbed, you must decide whether it is better to keep the stain or have a white spot. Sometimes a small patch of the same material may be sewn over an obstinate stain.

Some stains and how they can be removed will be now discussed.

Acids must be treated with an alkali. Sponge with diluted ammonia or cover both sides of the stain with sodium bicarbonate. Moisten with water and allow it to stand for a while. Finally wash with clear water.

Alkaline stains should be washed with warm water to which lemon juice, vinegar or cream of tartar has been added.

For *blood* stains soak in cold water. Then soak in warm water with ammonia. If it is only a fresh, small stain on heavy goods such as a blanket, spread thick starch paste on the stain, wiping off and renewing until all the stain has disappeared.

In the case of a fresh *coffee* stain, spread the cloth over a bowl and pour on boiling water from a kettle held high. For an old stain, cover the spot with borax or apply Javelle water, followed by boiling water.

In order that a *perspiration* stain does not become permanent, wash clothes immediately after every use before storing. Certain agents like ammonia can be used. Bleaching in sunlight is also an effective way of removing a perspiration stain.

If the *curry* stain is greasy, remove the grease first by pressing with a blotting paper. Then remove the stain by washing with warm soapy water.

For *commercial dyes* apply potassium permanganate and wash with warm water, or apply oxalic acid with a glass rod and wash.

Rub salt on *fruit juice* stains and wash out. Then treat the stain as you would treat a coffee stain or an acid stain.

Grease stains should be washed in warm water and soap. For cotton or linen, use Javelle water. Treat old, obstinate stains as you would treat dyes. If the material cannot be washed, apply alcohol or benzine with a cloth, rubbing very lightly, or absorb with starch, or iron with a warm (not hot) iron over thick blotting paper, repeating with fresh blotting paper till all the grease has been absorbed.

If the *ink* stain is on cotton or linen and if it is fresh, use soap and water. If the stain has dried, use a bleach and then oxalic acid and wash or soak in sweet milk until the latter turns sour.

If the ink stain is on silk and wool, sponge the area with hydrogen peroxide and then with oxalic acid or skimmed milk.

Blue and black ink on cotton should be sponged with cold water and then washed. Stains on rayon, silk or wool should be sponged with cold water. For fountain pen ink, apply citric or oxalic acid; wash out and then treat with Javelle water; or try Javelle water alone.

For an ordinary ink stain moisten with salt and lime juice and expose the stained material to sunlight; or soak in sour milk for twenty-four hours; or apply diluted citric acid, followed by boiling water.

For red ink stains, moisten with cold water followed by ammonia, or Javelle water.

For Indian ink on cotton, sponge with denatured alcohol; on rayon, sponge with carbon tetra chloride and on silk and wool, sponge with denatured alcohol.

Apply the same treatment for *iron rust* as you would for ink.

Soak *medicine* stains in alcohol and dry.

Mildew should be washed in cold water or treated as you would treat dye and ink stains.

Handkerchiefs and garments soiled with *mucus* should be soaked in strong salt and water. Remove the soiled water and add boiling water and then wash.

With *oil paint* stains dissolve the paint first in turpentine. If the stain is very old, soften it first with olive oil or kerosene.

Scorch marks, when they are slight on cotton and linen, hang the clothes in sunlight. Gently rub off those on wool and silk.

Soften *tar* stains with olive oil. Wash with soap and water.

Wash *tea* stains with cold water and soap if mixed with milk or cream. Use hot water if clear. If the stain is obstinate, apply the same treatment as you would for coffee.

Shake *water spots* in a jet of steam from the spout of a boiling kettle until thoroughly moist. Keep shaking the cloth till it dries.

Scrape off *wax* stains and then treat as you would for grease.

For *wine* stains put on a layer of salt. Apply the same treatment you would give to fruit stains.

Having mended and removed stains, sort the laundry into separate piles: (1) cotton and linen goods; (2) silk goods; and (3) woollen goods. Divide each pile again into white and coloured articles, separating the personal clothing from the household articles.

WASHING

The art of washing is to force soapy water through cloth by rubbing on a stone, on cement or on a wooden board, or by means of a machine. The latter is easier, more effective and less damaging to cloth.

STARCHING

Starch is used mostly on cotton. Starches make clothes stiff, crisp and shiny. There are two general types of starch. Vegetable starch, made of a wheat and corn mixture or plastic starch made of resins. The plastic type is comparatively new. The vegetable starches attach themselves to the fabric by covering its pores and by making the surface smooth, thus preventing dirt from collecting. When dirt does collect it adheres to the starch and is removed easily along with the starch in laundering. This type of starch is sold in the market in a liquid form.

There are two methods in starching. Starch may be released from their cells by means of boiling water, and the articles to be stiffened immersed in that solution. A solution prepared in this way is called boiling water starch. On the other hand, articles may be treated in a mixture which has not been heated so that the starch grains enter the fabric before their contents are released. The cells burst in due course by the application of a hot iron in the finishing process. Starch used in this way is called cold water or raw starch.

Boiling Water Starch. For this method take 1 tablespoonful of starch, $\frac{1}{8}$ teaspoonful of borax (optional), enough shredded wax or soap and water. Keep a kettle of boiling water, an enamel basin, a measuring cup, a wooden spoon for stirring and a large basin for diluting the starch.

Put the water to boil. Mix the starch into a smooth paste with 3 tablespoonfuls of cold water, and place in the smaller basin. The undissolved starch grains give the mixture its characteristic opaque white appearance. Add 4 cups of boiling water quickly to the paste, stirring continuously until the colour of the liquid changes to a transparent grey, as a result of the disruption of the grain, releasing the starch which is brought into solution. The starch thus prepared is called *starch jelly*. It should be diluted at once by adding an equal quantity of hot water. A little formalin or some other preservative should be added to starch to prevent it from becoming sour.

Cold Water Starch. Take 1 tablespoonful of rice starch of the best quality, ½ teaspoonful of borax, 3 drops of turpentine, ½ pint of water, and for use, 2 clean china basins, a measuring cup and muslin for straining.

Place the borax in the measuring cup. Dissolve it in a little boiling water, and add 2 cups of cold water. Place the starch in one of the basins, and drop the turpentine into it. Add half the liquid in the measuring cup. The starch should be then mixed into a smooth paste, till all the lumps have broken up into starch grains. This is best done by working with your hands rather than with a spoon. The mixture should be placed in an utensil, and added to the solution which has been strained through muslin. The starch is now ready for use but should be made to stand for a short period as this allows the cellulose walls of the grains to burst under the heat of the iron. If the starch is to stand for several days before use, a little formalin should be added to prevent it from becoming sour. It should be covered with a cloth to keep it clean. Cold water starch is employed when greater stiffness is required than could be given by boiling water starch.

Separate the articles into piles according to the kind of starching required: (1) all articles which require no starching such as linen table cloths, table napkins, table centres, doilies, sheets, towels, pillow cases, handkerchiefs, cotton curtains, and clothes worn next to the skin; (2) those which require clear starch, such as thin muslins, whether for personal or household use, and (3) garments which need ordinary starch such as those not worn next to the skin –jackets, blouses and cotton table cloths.

Starch articles requiring ordinary starching by dipping them into freshly prepared starch. Rub the starch evenly in, squeeze evenly and shake.

DRYING

Cotton. Shake well and dry in the open air. See that lines and clothes-pegs are perfectly clean, that articles hang straight and in good shape, and that the wind, if any, blows through the garments. If the colour of white clothes is not good, spread them out on the grass in the sun and moisten frequently. In the monsoon, garments may be dried on a bamboo or painted metal frame over a *sigri*.

Woollens. In drying woollens special care needs to be exercised. With those articles which do not stretch due to the weight of moisture, shake, stretch into shape and hang up to dry on a hanger in dry moving air, where the moisture will evaporate quickly. Fine delicate articles that are liable to stretch out of shape should be dried flat on a *charpoy* or bench to enable the free circulation of air. Occasionally you should lift, shake and turn them over. Never leave woollen garments near heated radiators or in the hot sun, because heat dries up the wool fibre causing it to become brittle and break.

Rayon. Since rayons are rendered weak by water, hang washed rayon garments to dry as soon as possible, seeing that the weight of the garment is evenly distributed, by suspending the garment over the line at the centre. Garments that will stretch out of shape should be dried flat.

Nylon. After thoroughly rinsing in hot clean water, the garment should be hung to dry without squeezing or wringing.

Terylene. Without wringing, the garment should be allowed to drip dry or be rolled in a clean towel.

Orlon. After rinsing in warm water orlon garments should be squeezed and placed on a towel to dry.

Do not wring synthetic fabrics. Hang them wet on the line as this prevents creases.

IRONING

Ironing is an acquired art. Perfect skill in ironing can be attained only after much practice. The following directions will help you to get good results:

1. Always slip a skirt board or a sleeve board through circular garments, such as shirts and skirts, or parts of garments, such as sleeves.

2. Iron cotton cloth which is slightly but evenly damp, and iron each part quite dry before going on to the next. Linen should be damper than cotton.

3. Let your iron be hot enough to 'hiss' when it comes in contact with moisture. If the moisture bubbles on the iron, it is not hot enough. If it evaporates without a hiss, it is too hot. Test the heat for suitability by rubbing the iron on a piece of old cloth or feel it yourself before using it.

4. Study the correct folding for different garments (Figure 98). Sleeves should be ironed first in a fitting garment; then the neck and finally the body. Do the back

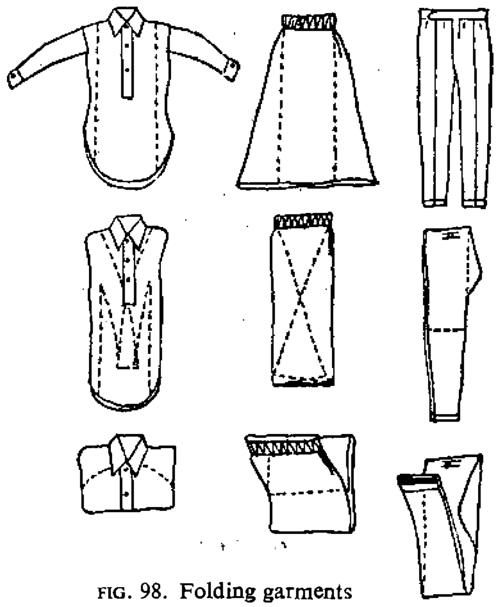


FIG. 98. Folding garments

last. With skirts, begin at the bottom. In ironing gathered frills use a pointed iron; begin at the edge and press the point up among the gathers. If the garment is pleated. iron the pleats flat, folding them as you go along.

5. Iron on the wrong side, anything on which you do not want a shining surface.

6. Place embroidery and lace with the wrong side facing you on a soft pad, so that the pattern may not be flattened.

7. Perform all these operations as deftly as possible, so as not to crush the ironed portion and to keep the article looking fresh.

8. Fold and press folds as you go. In ironing square and rectangular articles, such as handkerchiefs and table napkins, you must pull well into shape and get their corners exactly together.

Before ironing clothes take them off the line and sprinkle with water. Next, roll them together taking several articles at a time and press well to distribute the dampness evenly. Then pack the rolls close together in a basket. Articles that are to be ironed or mangled at once may be taken off the line before they are quite dry. Mangling or even stretching and pulling is often sufficient for household articles, such as towels, sheets and even saris, although ironing improves their appearance. In a hot climate, clothes should not be sprinkled and rolled more than an hour or two before being ironed as moist heat is favourable for the growth of mildew. In a cold climate, they may be dampened overnight. If your clothes get dry while being ironed, or if spots appear on them, rub them with a damp cloth.

For ironing those articles which need a smooth finish, you should iron in very hot, dry weather in the early morning or in the cool of the evening; otherwise your clothes will dry too quickly and you will also become tired.

LAUNDERING DIFFERENT TYPES OF FABRICS

White Linen and Cotton Goods. The different stages are:

1. Soak in cold water. If the clothes are made to soak overnight, they will require less rubbing in the morning.

2. Wash in cold or warm soft water; if the water is

hard it should be softened with soda and soap. Spots must be rubbed with soap by using a small brush.

3. Rinse in clear water and wring out.

4. Place in a boiler, pour over with clean cold water after which add soap flakes or small pieces of soap. Bring to boil quickly, stirring with a wooden stick for five minutes. Alternatively, you can rub clothes with soap, place on a bamboo or some other framework that does not rust, and then empty in a boiler half full of boiling water. Put the lid on, and keep the water boiling for about five minutes. For disinfecting, boil for half an hour.

5. Rinse well in hot water, and again in cold water. See that no soap remains, as some kinds of blue combine with soap and cause iron-rust spotting.

6. Shake the clothes out loose, immerse in slightly blued water. Wring out and shake well. A wringer may be used if it is available. The blued water should be stirred well before putting each garment into it, as the blue settles at the bottom and may streak the clothes. The water needs to be re-blued frequently, as clothes absorb the blue from the water and leave a greyish fluid behind.

Coloured Linen and Cotton Goods. For coloured items, omit soaking, boiling and the use of soda. Never wash different colours together. Wash quickly in warm water in which soap has been dissolved. Hang in the shade (never in sunlight) and allow them to dry as quickly as possible.

If the colour runs or comes out in the water, set it by adding a tablespoonful or more of salt to four litres of cold water. Substitute vinegar for salt for blue goods. The colours in embroidery silks nearly always need setting. For very uncertain colours, bran or soap-bark or soap-nut solution may be used instead of soap. Iron on the wrong side, with a warm iron.

Recipe for Soap-nut (reeta-nut) Solution: Add 2 table-spoonfuls of soap-nut shells or bark chips, enclosed in a mull bag, in a litre of boiling water for five minutes. Soap-nut shells, when boiled with water, give a lather which has cleansing properties, due to the presence of a substance called *saponin.*

The solution of soap-nuts is useful for washing colours which are sensitive to alkalis, because the solution is not alkaline and has no effect on dyes. It is also useful for other delicate fabrics.

White Woollen Articles. Brush and shake out dust before wetting white woollens and apply the same treatment you would give to coloured cottons. In addition, keep all the water used at about the same temperature. Avoid rubbing, wringing and twisting; squeeze water out by gently pressing. Heavy articles need rinsing several times. If water needs softening, use borax or ammonia. Dry woollen garments in the shade or in a room. Never dry them in a very hot or a cold place. Loosely knitted garments, such as jumpers, should not be hung out to dry, but should be spread in their right size and shape on a table over which a thick pad has been spread. Iron woollen clothes when half dry, under a wet towel. Never starch woollens.

Coloured Woollen Articles. The same treatment should be given to coloured woollen articles as you would give to white woollens and the methods for setting colours the same as with coloured cotton goods.

White and Coloured Silk Articles. Treat like woollens, with the exception that white silk articles may be soaked for a short time only when needed. If stiffness is required, use Gum Arabic instead of starch. Iron when damp under a thin muslin. Some silks, however, such as pongee, should be quite dry or very damp when ironed. Crepe silk and some fancy silks do not require ironing. They should be spread straight and smooth on a table, while still wet.

Rayons. Rayons should be washed very quickly in luke-warm suds, rinsed quickly and put on a clean clothes-line to dry.

Velveteen. Velveteen may be washed in the same manner as silk. Velvet can be freshened by being passed over steam. Hang up while wet and brush when dry. If it is necessary to iron velveteen pass it quickly while damp, over an inverted iron, that is, one held upside down.

Lace. Lace should be shaken and squeezed but never rubbed in warm soapy water and then rinsed out in water, which is slightly blue. If a cream colour is wanted, add a little strong coffee to the last rinse. If a slight stiffness is required rinse in a weak Gum Arabic solution. Lay the lace between two cloths to absorb the moisture. Do not iron delicate lace, but when it is nearly dry pull it gently into shape and pin the edges on to a piece of flannel or a firm cloth. Ordinary lace, such as that used for under-clothing, may be ironed.

DRY CLEANING

The term *dry cleaning* is somewhat misleading as it suggests a treatment with drying agents, while the cleaning of fabrics is generally carried out with water. Dry cleaning is done by immersing fabrics in a volatile grease solvent.

The difference between *dry cleaning* and *washing* is that in the former method the liquid permeates the fabric without having any action on the fibre, while in the latter the liquid permeates and acts upon the fibre. The result is that washing cleanses articles more completely than dry cleaning. On the other hand, the action of water on the colouring matter of some fabrics often makes its use impracticable or undesirable. In such cases cleaning with a solvent or absorbent is a valuable substitute.

The following are the reasons for resorting to dry cleaning:

1. Some fabrics cannot be treated with water without their shrinking.
2. Certain coloured fabrics 'run' when they are treated with water.
3. Some fabrics cannot be ironed wet, without resulting in the appearance of water marks. They have to be ironed dry, after washing, with the result that a good finish is difficult.
4. Some fabrics take a lot of time to wash well in water, and still generally do not have a good finish.

Dry cleaning is employed for woollen goods and goods which spoil in water, and articles of apparel such as shoes, sandals, waterproof coats, straw and felt hats and furs which cannot be cleaned by washing. Fuller's earth, or dry starch is freely sprinkled all over the garments to be dry cleaned and then rolled in a clean cloth. After some time the powder is shaken out, taking the dirt with it.

Boots and shoes need to be brushed, smeared with polish according to the directions on the bottle or tin, rubbed and polished with a soft brush or cloth.

White canvas shoes should be brushed and covered with the preparations of chalk, sold as 'Blanco' in the market, and dried in the sun.

Sandals are usually rubbed with oil.

Waterproof coats should be hung on hangers, washed with a soft brush dipped in warm soapsuds, squeezed in water and left hanging to dry.

Felt and straw hats should be brushed well. If they are faded or out of shape, they should be sent to a hat-cleaner to be dyed and reshaped.

Furs and soft leathers may be washed with soapsuds and warm water after having their lining removed. They should be rinsed in luke-warm water and spread out to dry. If the leather is too dry and is liable to crack, rinse in warm water to which a little vegetable oil has been added; or rub in a very little linseed or lemon oil at the back of the skin.

Some of the common faults in washing which need to be avoided are:

1. Using soda with soap for washing, instead of using it only for softening the water. A soda solution weakens cloth.
2. Using chloride of lime to whiten clothes. This only helps to tear cloth.
3. Beating clothes hard on stones. The result is damaged cloth.

ASSIGNMENTS

1. Make a soap solution, a soap-nut solution, Javelle water, starch and blue water.
2. For what purposes can Javelle water be used?
3. Why are white clothes starched and blued?

4. Remove stains such as those caused by fruit juice, rust, ink, grease, oil-paint and coffee.

5. Practise the different methods of washing on different kinds of fabrics.

6. Plan out the work for a washing day in a small family.

7. State how silk becomes yellow, and what causes wool to felt.

8. Compare over a year how well clothes stay when (1) they are given to the *dhobi*, and (2) when they are washed at home.

CHAPTER XXX

HOME NURSING

Articles required : Bed and fittings, watch with second hand, towels, clinical thermometer and medicine chest with its content.

IN this chapter we shall consider briefly the preparations which must be made in a home to care for invalids generally and what we can do to increase the patient's chances of recovery.

THE QUALITIES ESSENTIAL IN A NURSE

In deciding which member of a family should act as a nurse in the event of sickness, what are the special qualifications we should look for? The most important criterion is that the nurse herself should be well; in other words she should possess a strong constitution. Only then will she be able to resist infection and have the strength to endure the strain of nursing. An optimistic and deeply interested approach to nursing is bound to make her succeed in her efforts and stand out among those who take on the responsibility merely out of a sense of duty. She should be gentle and kind both in words and deeds, making the patient feel that her services are rendered willingly. At the same time, she must be firm, observant and understanding to her patient's needs and requirements. She must be sympathetic even when the patient is irritable and must be cheerful in the face of discouragement. Cheerfulness is often worth more than medicine.

A nurse must be accurate in observation and in reporting these observations to the doctor. She can never be careless in the performance of any of her duties. She must possess presence of mind, and be able to keep calm and be courageous in emergencies. Promptness in thinking and acting is a necessary virtue at all times. Orderliness, too, is most important in the care of rooms, administration of medicines to the patient and in all other details of nursing. A nurse must be quiet in manner, speech and actions. She must obey the doctor's instructions implicitly and prove that she can be relied upon. When in doubt she should ask him questions and be sure that his orders are understood. Regularity with regard to food and medicine is no less important for in some cases even a slight delay may cause trouble. Therefore the nurse must plan her routine, allowing adequate but specific time to each of her duties. Her own dress and accessories must be neat and clean and she should see that her hands in particular are kept smooth and clean. A nurse must be unselfish and ready to serve others always. Her work must be thorough in all respects.

THE HOUSEHOLD MEDICINE CHEST

Every home must have a special medicine cupboard with a lock placed at a height out of the reach of children. The medicine chest should contain the simple remedies which might commonly be needed in emergencies. Never keep medicines from old prescriptions, as they lose their strengths and are not valid for conditions other than those for which they were originally purchased. Keep a few bandages, some cotton wool, a bottle containing sterile gauze or lint, a hot water bag, an eye-cup, a clinical thermometer, a medicine glass, adhesive plaster, oiled silk, eucalyptus, vaseline, tannafax, camphorated oil, castor oil, permanganate of potash, tincture of iodine, boric acid powder, bicarbonate of soda, Epsom salts, quinine, calomel, ammonia, aspirin, mustard and ipecacuanha.

THE SICK ROOM

Choose a room or space which is cheerful in its aspect but isolated from the rest of the house, in order to provide a quiet atmosphere for the patient and also to lessen the danger of others being infected. In times of illness one's nerves are especially sensitive and noise can be very irritating. The patient should sleep as much as possible, and silence is of the utmost importance. The danger from infectious deseases, such as mumps, scarlet fever, diphtheria, smallpox, cholera and tuberculosis, is very great. Therefore isolation of patients suffering from these complaints is imperative.

Air. The room should be large and have two windows for cross ventilation, but draughts must be avoided. A good supply of fresh air is of great help to recovery.

Light. Sunlight is a great germicide and helps in the cure of disease. It is also responsible for developing Vitamin D on the skin. Therefore do not shut sunlight out all the time. although it is necessary to do so in the middle of the day. The patient's eyes should, of course, be screened from the glare.

Temperature. The sick room should be kept at an even temperature. In summer, cold water may be poured over the floor if it is of stone or cement to lower the temperature and *khus-knus tatties* hung at the doors and windows. In cold climates, it is wise to select a room with a fireplace and chimney. This provides ventilation as well as warmth.

Furnishings. Remove all unnecessary furniture and ornaments from the sick room. Pictures become tiresome to an invalid and extra furniture requires extra cleaning. A bare floor, with only the patient's bed, a bedside mat, table and a comfortable chair would be adequate. Keep medicines on a shelf and not on the bedside table.

Cleaning the Room. In order to avoid raising dust when sweeping, wipe the floor with a mop. Dust with a moistened cloth. Remove soiled articles immediately from the room.

The Bed. A metal bed is the cleanest. The mattress should be firm though soft, and should be protected by a covering which can be changed. Place the bed with the head beside the window and not in a corner or facing the light from either the windows or the door. Such an arrangement would provide good ventilation, prevent eye-strain and permit the nurse to reach her patient from both sides of the bed.

Making the Bed. Lay a square of rubber cloth about half-way down the bed, and on top of the bottom sheet. Over this, draw a sheet which has first been folded lengthwise. This is called a *draw sheet*, and it should be tucked in well on one side and then drawn very tight and tucked under on the opposite side. This sheet can be changed more easily than the large sheet if the bed requires it; it is also easy to tighten if the sheet becomes wrinkled. Place the *top sheet* on and first tuck it well in at the foot of the bed, leaving enough of the sheet at the head to turn back over the blankets and counterpane. The sides are not tucked in all the way to the head, for you must leave an opening for the patient. A mosquito net should be hung over the bed to keep away mosquitoes and flies.

Changing sheets with a patient in bed is fairly easy if the patient can be turned. Put the patient on her side with her back towards you. Remove all covers but the top sheet, or leave only enough covering to keep the patient from being chilled. Loosen the soiled bottom sheet from under the mattress on the side from which you are working. Gather it into long folds and push it well up against the patient's back. Take the fresh sheet, which has been previously gathered into smooth folds, leaving just enough unfolded to tuck in under the edge of the mattress. Lay this on the bed and tuck in the unfolded part the full length of the bed. Push the folds of the clean sheet close against the back of the patient and turn her over towards you, with her face to the side of the bed which has been covered with the clean sheet. Go to the other side of the bed and draw out the soiled sheet, removing it from the bed. Draw the clean sheet over from behind the patient, smooth and stretch it and tuck it under the mattress edge. Change the draw sheet and rubber in the same way.

Lifting and moving a patient in bed can best be done by standing on the right side of the bed. Let the patient put her arms around your neck. Then put your left arm around and under her shoulders, leaving your right arm free to adjust the pillow or do anything necessary. To move her to the side of the bed, put your arms under her shoulders and hips and draw her to you.

Changing the night-gown is more easily accomplished if it has a slit down the back. This is also more comfortable for the patient. If it does not have a back slit, the method of removing the gown is as follows: draw the gown well up under the arms (working under the sheet). Draw one sleeve off and lift the gown over the patient's head; then slip off the second sleeve. Reverse the order for putting on the fresh one. Put one sleeve on, put the gown over the patient's head, put the other sleeve on and pull the gown down under the patient, leaving no wrinkles.

Bed sores are the result of pressure, and the use of unclean, damp or wrinkled bedding. Good nursing should be able to prevent these. If the limbs, back and shoulders are rubbed with alcohol to keep up the circulation and the bed kept in a proper condition, there should be no sores to reproach the nurse. Zinc ointment helps to heal sores, if the skin is broken.

BATHING A PATIENT IN BED

Bathing a patient in bed should be done either an hour or more before or after breakfast. Have everything ready before beginning: sheets that have been sunned, night-gown aired and cleaned, towels, wash-cloths, soap, alcohol, a jar for waste water, a large basin or brass vessel on a chair or stool, and hot and cold water. Put a blanket under the patient in the same way as you did the sheet, place another over her and remove the night-gown or sari.

Begin by bathing the face and ears and continue in this order: face, ears, neck, arms, chest, abdomen, legs and then feet. Turn the patient on her side, wash her back and dry it; then rub her back, shoulders and hips with alcohol. Let her lie on her back and wash the pubic region.

In bathing each part, place a towel under it so that the blanket will not get wet; dry each part before beginning to wash another. Change the water after bathing the trunk and again after bathing the legs and feet. Hands and feet may be placed in the basin and washed. Wipe thoroughly,

FIG. 99. Steps followed for sponge bath

so that no bed sores form. The patient's teeth must be brushed, hair combed and nails cleaned.

Sponge Baths. The precautions to be observed while giving a sponge bath are the same as the ones already described. Smooth and clean pieces of flannel or sponge are used to give sponge baths. The sequence of washing is carried on in the same order. Soap is applied to one of the flannels and this is used to soap a certain section of the body. Then the part is wiped with another flannel wetted with hot water. This is continued until the area is satisfactorily cleaned and the part is wiped with a dry flannel. After giving a sponge bath, the wet flannels should be washed and dried. The steps involved in giving a sponge bath to a patient in bed are shown in Figure 99.

KEEPING RECORDS

The doctor can determine the nature and progress of a disease by noting the rate of the heartbeat or pulse, the respiration and body temperature. Therefore a record of the temperature, pulse, respiration, amount of sleep, amount of food taken, the number and description of excretions should be made regularly in the order given below:

Time	Temperature	Pulse	Respiration	Medicines given and time	Bowels	Urine (amt) passed	Vomits	Food quantity and kind

The nurse therefore should be expert in recording this information.

TAKING TEMPERATURES

The temperature of the patient should be taken every night and morning and recorded on a chart. The temperature is taken by placing the mercury end of a clinical thermometer under the tongue and closing the lips. One minute is the usual length of time required for a temperature-reading. The method of taking temperature in this way is shown in Figure 100. However thermometers differ,

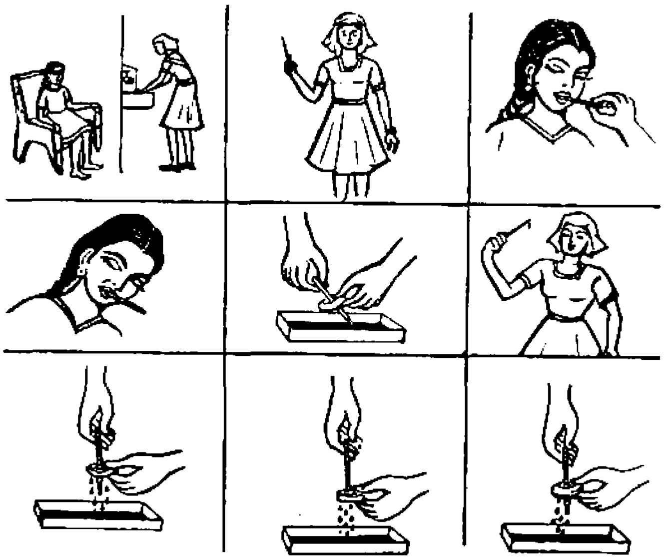
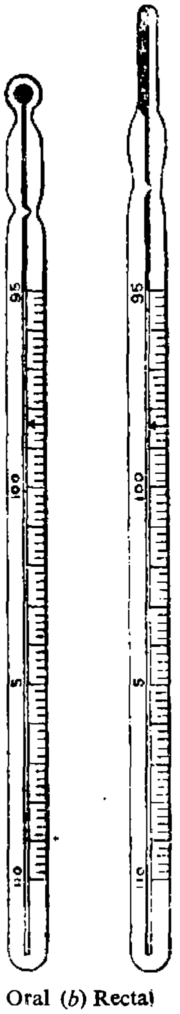


FIG. 100. Taking temperature by mouth

and some require a longer time to record temperatures. A thermometer cannot be inserted in the mouths of such patients as children, delirious patients or those who are extremely ill and others who cannot be expected to keep



(*a*) Oral (*b*) Rectal
type type
FIG. 101. Clinical thermometers

the thermometer under the tongue without biting and breaking it. Rectal or axillary temperature must then be determined. The thermometers used for these two purposes are shown in Figure 101.

Rectal Method. A special thermometer called a rectal thermometer is used in this method. Wipe, read and shake the rectal thermometer. Lubricate the mercury bulb. With the patient on his side, fold back the corners of the bed linen and separate the buttocks so that the anal sphincter is seen clearly. Insert the thermometer up to one and a half inches. Leave the thermometer in place for two minutes. Remove, read and record the temperature. The rectal temperature is not reliable. A baby's temperature is usually taken under the arm. or in the rectum. The temperature recorded under the arm is one half-degree lower than in the rectum and one half-degree higher than in the mouth.

Axillary or Groin Method. Wash and dry the thermometer and also make certain that the skin surfaces are dry. Place the thermometer well into the axilla (Figure 102), or groin in position as the case may be, with the bulb completely surrounded by skin and directed towards the patient's head. No clothing should intervene. Draw the arm across the chest, or cross one thigh over the other as the case may be, to hold the thermometer in position and leave it in position for ten minutes or at least double the length of the time stated on it. Remove the thermometer, read and record. Always wash the thermometer in sterile cold water before putting it in the patient's mouth and place it in a glass of antiseptic lotion after use. Although simple and hygienic, these positions are not suitable if (1) the patient is very thin; (2) it is done immediately following a hot bath, and (3) a hot water bottle has just been removed from that area.

FIG. 102. Axilla Method

The normal temperature of the body is 36°C. If it is lower than this we call it sub-normal. Temperatures above normal indicate fever, which is usually lower in the morning than at night. Moderate fever is indicated at about 37°C. in the morning and from 38°C. to 39°C. at night. High fever will register 38°C. to 40°C. in the morning and 40°C. at night. This temperature is dangerous if it continues for long. The doctor must be called immediately. To reduce the temperature cold sponge baths and cold compresses and ice-bags may be applied, or the back may be rubbed with alcohol.

Fevers end either slowly as in the case of typhoid, or suddenly as in pneumonia. When a sudden drop in temperature occurs, apply hot applications and give hot tea or medicine to prevent heart failure.

TAKING PULSE RATES

The normal pulse of a man is 60 to 70 beats per minute, and 65 to 80 beats per minute for a woman. The pulse rate of a child is from 90 to 100 beats. The pulse varies according to age, activity and position. Respiration is normally 18 to 24 breaths per minute. Try to count it when the patient is unaware of your doing so. Sometimes you can continue to feel the pulse and pretend to be counting it, while in reality you are watching the chest rise and fall.

FEEDING THE PATIENT

Meals for the patient should be served punctually and daintily, with clean linen and dishes so as to tempt the patient's appetite. Take care to serve hot food really hot, and cold food cold. Do not serve large quantities, but give the amount the patient is permitted to have.

Food for invalids, like food for children, must be easily digestible and furnish adequate amounts of tissue-building materials, that is proteins, mineral salts and vitamins. If the disease is a *wasting one*, the tissues will need an abundant supply of new material. That is why, in tubercular conditions, milk, eggs, meat, fruits and leafy vegetables are given in large amounts. These foods are good for all sick people, if prepared properly. Diets for sick people are classified into four groups:

1. *Liquid diets* are usually prescribed for invalids who have digestive troubles or to patients after an operation. They are broths, vegetable or meat extracts, tea, milk and

buttermilk, gruel, egg-milk drinks, cream, soups, cocoa and fruit juices.

2. *Semi-liquid diets* include jellies made with gelatine or *agar-agar* (China grass), meat jellies, custards, *kanji*, cereal jelly, strained vegetable pulp, milk, toast, ice-cream, *khir* and *pyasam*.

3. *Soft* or *semi-solid diets* are similar to the semi-liquid, but they are more solid and are not strained. Additional dishes of chicken, fish, milk puddings, stewed fruit and creamed dishes may be added.

4. *Solid diets* include any food simply prepared and which is easily digested. Solid diets permit more variety in methods of cooking and serving.

MEDICINES

Request the doctor to write down his orders regarding the dispensation of medicines, so that no mistake may be made with respect to time, amount and sequence in which medicine is to be given or a particular treatment is to be administered. All medicines should be labelled and locked up and only the nurse should have access to them. Poisons should be marked unmistakably with a coloured label and placed on the top shelf or otherwise, along with strong medicines, they should be separated from others.

Never give or take medicines in the dark. Never use an unlabelled medicine, either liquid or powdered. Look at the label three times: first when you take the bottle from the shelf, second when you pour it out; third when you return the bottle to the shelf. In this way you will avoid giving the wrong medicines by mistake.

Measure carefully and exactly the quantity ordered by the doctor. For this purpose, have ready the measuring glass or other equipment. Buy only the amount required and keep the bottles corked. Give medicines at the timings ordered.

SOME SPECIAL HOME NURSING APPLICATIONS

Counter-irritants. Counter-irritants are used to draw the blood to the surface of the body and speed the circulation of blood at the point at which they are applied. They are also capable of drawing blood from a congested area in other parts of the body. Counter-irritants may be hot or cold. The most commonly used preparation which is used for producing a counter-irritant effect is a mustard paste. A rubber bag or a bottle filled with hot sand or hot salt is a useful means of heating some special part of the body. Ice bags too can be used. They are made of rubber and can be partially filled with crushed ice and covered with a piece of cloth.

Stupes. Stupes are cloths wrung out of boiling water. Sometimes the doctor will order turpentine mixed with a little oil to be added to the water. Stupes are used to supply moist heat and this helps to create a soothing effect on the skin. They are generally given when the patient is suffering from some pain. Stupes for high temperatures have a greater soothing effect but one should take care to remove the cloth applied on the skin once or twice every minute.

Use a cloth, preferably white flannel, three times the size of the area to be covered. In order to wring dry a cloth so hot that you cannot do it with your hands, lift the cloth with a wooden stick and lay it in the middle of a towel; then twist the ends of the towel in opposite directions till no more drops of water can be squeezed out. Unfold the flannel, shake it well, and place it on the patient. If the flannel has been properly wrung and shaken it will not burn the skin. Cover it with a piece of mackintosh or clean plantain leaf over which a dry towel should be placed to keep the stupe warm. Keep in place with a firm binder. Keep the water hot so that another stupe may be applied in about twenty minutes and continue for as long as prescribed.

Hot and Cold Compresses. The application of a warm moist gauze dressing is known as a *hot compress*. When given to a patient the initial application of heat should be greater than the successive ones.

Depending upon the area of skin to be compressed either cold or hot compresses are used. Use clean bits of cloth, pieces of gauze or cotton wool and dip in hot or cold water. Apply them to inflamed parts for fifteen minutes at a time. Sometimes hot and cold compresses are alternated. If they are applied to an infected part, like the eye, never use the same compress on both eyes and always take care not to touch the eyes. Keep everything very clean.

PATIENTS WITH INFECTIOUS DISEASES

In cases of infectious diseases, a doctor must prescribe the treatment. The home nurse should be able, however, to meet emergencies, to co-operate with the doctor and to nurse the patient under his directions. The tables at the end of the chapter may be referred to as a guide to help you distinguish certain infectious diseases.

Isolate the person who has been in contact with an infectious disease and determine whether or not he is also going to develop it. In this way, we can protect healthy people and prevent the spread of disease.

After any infectious disease has been treated and the patient is well again, his clothes, accessories, sheets, pillow cases and towels should be boiled for half an hour. Woollen and coir fibre articles should be soaked for two hours in an izal solution. Other textile fabrics can be sprayed with pure carbolic acid solution and sunned for several days. Leather articles can be wiped with a one per cent formalin solution. Boil cooking and eating utensils for at least fifteen minutes and if boiling has any ill-effect on them, you can soak them instead in a one per cent formalin solution for five minutes.

Scrape the walls of the sick room and burn the scrapings. Whitewash the walls. Scrub everything that will stand it, such as the bed frame, furniture, woodwork and windows with soap and hot water. Earthen floors can be disinfected with kerosene emulsions and cyanide. Scrub the woodwork and floor of the latrine with mercuric chloride solution. By boiling, scrubbing and sunning everything in the house you can make it safe to live in.

CHOLERA, ENTERIC OR TYPHOID FEVER, DYSENTERY AND DIARRHOEA

Cholera, enteric or typhoid fever, dysentery and diarrhoea are caused by swallowing the germs of these diseases through water or food, and thus allowing them to reach the intestines where they grow and multiply. It takes only two days to develop the symptoms of the disease. The germs are strong and are able to live a long time outside the body, if the surroundings are kept damp. That is why they live so well in water and on moist food.

How do these germs get into water and food? That is the most unpleasant part of the story. As already seen they cannot get there except through the careless and unclean habits of people who have the germs in their intestines, or the carelessness of those who look after the sick.

Germ Carriers. Some people, who have been afflicted with these diseases, carry the germs with them even though they have recovered. Others who have never shown symptoms of the diseases can also carry the germs in their intestines without being affected. It is these people who are responsible for spreading epidemics. It is therefore important that every person, whether sick or well, takes all the precautions necessary to ensure the proper disposal of body wastes. Any person who has disease germs in his intestines may spread them with the faeces and urine which he voids. These body wastes should be disposed of in sanitary closets, and lime sprinkled over each evacuation. If the wastes are allowed to lie on the top of the soil, or drain into open sewers, flies will settle upon them and carry the disease germs away on their legs. Flies are filthy creatures and every one of them is an active agent in spreading germs.

Another way by which the active germs of cholera, diarrhoea, dysentery and typhoid fever enter our bodies is through the water we drink. Faeces and urine which are carelessly disposed of may seep through the soil into tanks, wells or rivers. Furthermore, people who bathe in tanks, after attending to nature's demands, scatter germs of these diseases, which are then taken in by the other bathers, and by those who drink the water or use it for washing their mouths or utensils. Again, if the clothes of those who are sick, or carriers of these diseases, are washed in the water which others use for drinking and bathing, they, too, spread the infection. To take in germs in drinking water is an especially dangerous way of contracting diseases for water passes so quickly through the stomach that the acid of the stomach has little chance of destroying the germs. We should therefore be extremely careful not to contaminate water. We must also make sure that the water is pure before we drink it. When there is cholera or enteric fever in the neighbourhood all the families must be inoculated against them.

In the event of an infection we must not only look after the patient, but also see that the disease does not spread to others. First, a doctor should be called in. If there is a good hospital near by, the sick person should be admitted there, where good nursing and medicines can be secured as well as the doctor's care. The sick who are taken to hospitals have a much greater chance of recovery than if they are nursed at home. It is also safer for the family.

Infectious diseases should be reported at once to the local Health Officer. It is our duty to notify the authorities, so that precautions may be taken to prevent an epidemic. We should obey the Health Officer and not leave the house if he orders so. By putting into quarantine the entire family of those who have cholera is one way of stopping the spread of the infection. If we disobey and go out when we are quarantined, we may cause many more deaths.

Nursing Precautions. If proper precautions are taken, infectious patients can be nursed at home. It is cruel to neglect the sick because of the fear of getting the infection. What should we do to safeguard ourselves while nursing a person with an infectious disease? The following steps must be taken:

1. All wastes from the body of the patient must be

disinfected. Carbolic acid and lime may be used for this purpose. Burning or burying all waste matter at once is another way of safe disposal. However, never bury waste near any source of water supply. Vomit, urine and excreta should be covered well with earth. It is much safer first to pour lime over them and then place the earth.

The wastes from all the members of the family should also be treated in the same manner, since it is possible that they may harbour the germs without being aware of it. Use carbolic acid or lime in the closet or bury the waste as shown above.

2. Everything used for the sick person must be kept separate from the articles used by the family. His dishes, trays and cups should be washed separately and boiled in water to kill the micro-organisms. His clothing and bedding, too, should be washed separately and boiled.

3. The house itself as well as the sick room should be sunned and aired well. Dryness and sunlight destroy germs.

4. Wash hands with warm water and soap, and use some disinfectant on the hands after being with the patient. Always disinfect your hands before eating.

5. All drinking water should be boiled and then cooled and kept covered. Pour the water out into a cup instead of dipping a cup into the water.

6. Cook all food. Do not serve raw food during the time of intestinal infections. Keep all food covered from dust, dirt and flies. Do not use food which has been cooked the day before. The germs causing cholera grow in cooked rice that has been allowed to stand.

7. Keep visitors away. They may contract and spread the disease.

8. If anyone is suspected of having the disease, keep him in a separate room for forty-eight hours. Anyone who has been exposed to infection should also be isolated for two days, until it is known whether or not he is free from the germs.

9. When the patient has recovered and been removed from the sick room, the entire place occupied by him should be cleaned with washing soda and sprayed with a disinfectant.

HOME NURSING IN INJURIES AND EMERGENCIES

1. *Burns.* Burns are caused when the skin comes in contact with fire, heated metal, electrically-charged wire or some chemical. A scald is caused by boiling liquid. The treatment is the same for all except for burns caused by chemicals.

If clothing has stuck to the burn, do not pull or tear it off but cut around it. Clean gently with swabs of cotton wool moistened with boiled water or a weak antiseptic lotion. Dry and apply strips of gauze spread with tannafax. If tannafax is not available, soak the gauze in the white of egg and apply to the burnt surface. If the burn was caused by an acid, it can be neutralized by applying a weak solution of washing or baking soda, and if the cause was an alkali, a weak acid, such as lemon juice or vinegar, could be used. Any trace of the alkali should be first removed gently.

A bad burn, besides causing great pain, gives the patient a nervous shock. Therefore it is absolutely essential to keep him quiet and warm. Give milk stimulant such as hot coffee or salvolatile.

Since fire needs oxygen to be able to burn, it will go out if it is deprived of it. Therefore when your clothes, or someone else's clothes, catch fire, roll firmly round the blazing person a thick blanket or rug so as to shut off the supply of air. Do not use thin cotton cloth, since it is very inflammable and porous. If nothing is at hand, roll the patient on the floor in the sand. Do not permit him to run, as running causes a draught and will make the clothing burn more briskly.

The general rules for the treatment of burns are:

A. *When medical aid is readily available*

(i) Do not remove clothing and do not break blisters.
(ii) Cover the area (clothing included) with prepared sterile dressings.
(iii) Apply a pad of cotton wool.
(iv) Bandage firmly except when blisters are present or suspected, in which case bandage lightly.
(v) Wrap the patient in blankets to keep him warm.
(vi) In severe cases, immobilize the affected area by the application of slings, bandages or splints.
(vii) Give large quantities of warm fluids, preferably weak tea sweetened with sugar.

B. *When medical aid is not readily available*

(i) Do not remove clothing and do not break blisters.
(ii) Wet the area of the burn, including the clothing, with a warm alkaline solution, such as two teaspoonfuls of baking soda (bicarbonate of soda), or one teaspoonful of common salt to a tumbler of water at body temperature. This treatment will relieve pain and thereby minimize shock.
(iii) Cover the area with prepared sterile dressings soaked in a similar solution and keep them moist with the solution.

If the above solutions are not available, cover the area with prepared sterile dressings.

(iv) Apply a pad of cotton wool.

(v) Bandage firmly in position, unless blisters are present or suspected, in which case bandage lightly.

(vi) Wrap the patient in blankets to keep him warm.

(vii) In severe cases immobilize the affected area by the application of slings, bandages or splints.

(viii) Give large quantities of warm fluids, preferably tea, sweetened with sugar.

When the face is burnt, cut a piece of clean cloth in the shape of the face and make a hole for breathing. Moisten the dressing with one of the solutions described above and apply keeping it moist.

2. *Bruises.* Bruises or swellings in the skin are caused by blows, knocks and bites of insects. They should be treated with cold water or iced dressings. A doctor should be consulted in the case of persistent swellings.

3. *Bites and Stings.* When bitten or stung by snakes, tarantulas, scorpions, bees and other insects, dogs or cats, the preliminary treatment is the same. The poison is more likely to enter a vein than an artery, because the veins, which are the pipes taking the blood to the heart, lie near the surface, while the arteries are more deeply seated. Since the object of first aid is to prevent the poison from reaching the heart and thereby affecting the nervous system, the vein through which the poison is likely to pass must be closed immediatedly by compression, just as one might close an empty bicycle tube. The vein closed must be between the bite and the heart. Therefore tie a piece of tape, string or cloth tightly at once around the limb whether it be a finger, wrist, arm near the elbow, toe, ankle, or leg

near the knee, so as to prevent the blood from travelling along its course. The vein should be compressed with the finger while the ligature, that is, the tight bandage, is being prepared. It is best to tie two or three ligatures along the limb. If the bite is on a part of the body which cannot be tightly tied, for example the neck, then press with the fingers, or with a small pad, the veins between the bite and the heart, tight on the bone. Veins are very compressible and if forced against anything hard they get closed immediately. Loosen the ligature every twenty minutes for a few seconds.

Having thus prevented the poisonous blood from reaching the heart, attend immediately to the wound. Take 'blood-warm' water, which encourages the flow of blood, and bathe the wound freely, squeezing out the blood and with it the poison. Do not use very hot or cold water, since these temperatures tend to clot the blood and prevent its flow. Further treatment will vary, according to the origin of the wound.

(i) *Snake Bites.* In snake bites, two little red spots, where the fangs have entered, can usually be seen. The poison is injected into the skin through these two small holes made by the poison fangs of the upper jaw of the snake. The poison is rapidly absorbed in the circulation causing fainting, sweating, vomiting and even death in young or debilitated persons. In addition, there is much swelling and pain at the site of the bite.

The first aid treatment given for a bite on the hand or foot is:

Hang the limb down and apply immediately a triangular bandage, necktie, or handkerchief as a tourniquet on the heart-side of the bite, just tight enough to congest the veins.

and stop the flow of poison towards the general circulation. There is no need to stop the arterial flow. Keep the tourniquet on for half an hour. Cut the skin near the bite with a sharp knife (which has been sterilized by inserting into a flame and then cooled), make a deep cross and suck the wound to extract the poison and encourage bleeding. Get the patient to do this, if possible. But take great care to spit out the poison. On the cut rub potassium permanganate crystals.

Keep the patient absolutely at rest as movements encourage the spread of the venom in the body.

Bathe the wound with water made dark red with permanganate of potash to neutralize any poison on the surface of the bite.

Give hot coffee or tea and keep the patient warm. This helps to avoid or lessen the shock.

Simultaneously send for a doctor or take the patient to the nearest doctor or hospital for an anti-snake venom injection.

If breathing fails, apply artificial respiration.

(ii) *Tarantula Bite*. Apply the same treatment you would give to a victim of snake-bite.

(iii) *Scorpion Sting*. This is not generally dangerous, but is extremely painful for several hours. Bathe with diluted ammonia or with methylated spirit. The application of some non-burning alkali, such as a paste of bicarbonate of soda or a solution of washing soda, helps to relieve the pain; or dab with a *dhobi's* blue bag. Pain-relieving injections are also now available.

(iv) *Wasp, Bee or Hornet's Sting*. The same treatment should be given as that given for scorpion stings.

(v) *Dog or Cat Bite*. If the animal is known to be healthy, treat with iodine, lest pus-forming bacteria breed, and apply a suitable dressing. But if there is any reason for suspecting rabies, burn the wound well, either with a red-hot wire or a flame, or with pure carbolic acid applied on cotton wool at the end of a match pressed down well into all parts of the wound. Undiluted tincture of iodine may be used if nothing else is at hand, although this is not entirely dependable. Then go to a doctor immediately. If the dog turns out to be mad, anti-rabic injections must be started immediately. Remember that if even a scratch from the paw of a mad animal or saliva from the mouth gets into a crack in the skin, rabies will be transmitted.

NURSING SKIN INFECTIONS

1. *Itch.* Itches are caused by small mites. Children cannot rest and grow strong if their lives are tormented by these tiny animals which are too small to be seen. They cause irritation on the surface of the skin and then, when the skin is broken by scratching, they crawl in and lay their eggs. The eggs hatch and more mites spread all over the body, clothes and bedding.

A doctor should be consulted at once. If a doctor is not available, the following treatment should be undertaken: bathe in hot water, scrubbing well with soap where the itching is felt; then rub with sulphur ointment and put on clean clothes. Do this on three successive nights; be careful to dilute the ointment for a baby's skin. Do not scratch.

Another variety of itch, known as *dhobi's itch,* is caused by a tiny plant called *fungus* which grows in the skin, forming spores or seeds. This is harder to cure and you should get a doctor to give you medicine, if possible. In any case, bathe daily and change into clean underclothes that have been previously boiled. Sprinkle a powder made by combining equal parts of starch (cornflour), oxide of zinc, and boracic acid, over the sore places or use an ointment of carbolized zinc and cover with a soft clean cloth.

2. *Ringworm.* Ringworm is caused by a tiny plant. The sores spread in all directions from the centre, healing from the middle and spreading at the edges, thus forming a 'ring'. The doctor should be consulted to check its spread.

3. *Lice.* Lice develop from long white eggs called nits, which stick to the hair. There they multiply rapidly. Two female lice can produce ten thousand in two months. These pests, like the itch-mite, prevent children from getting proper rest.

In order to get rid of hair-lice, mix equal parts of sesame oil (gingili) and kerosene. Smear the scalp with this mixture and wet the hair thoroughly. Wrap the head in an old cloth and leave the lotion in the hair overnight. Keep away from unprotected lights and flames while the lotion is on the head, since kerosene is inflammable. Wash the head and hair next morning in soap and warm water. Comb the hair with a comb dipped in vinegar. The vinegar loosens the nits.

Cleanliness is the only way of keeping free from lice. A daily combing of hair with a fine comb is a good precaution.

Body-lice are larger than hair-lice. Remove clothing and sun them in direct sunlight. Take a bath, in which bicarbonate of soda has been dissolved (use 100 to 140 g. soda to a tub of water). Mix 5 ml. glycerine with 7 g.

pure carbolic acid, and add the mixture to half a litre of water and rub the body with the solution.

To destroy the crab-louse, use mercurial ointment, and keep the parts clean by washing several times a day.

CONSTIPATION

Constipation is most often the result of nervousness, or failure to form a regular habit of evacuation. Fear, worry and emotional strain may cause indigestion and constipation. If good habits are established in childhood, one will never have the problem of constipation. Regular evacuation of the bowels must become an unconscious process. The more one makes it habitual the better it is for one's health. Exercise and drinking plenty of water help to form this habit. Eating green or succulent vegetables is another good way of preventing constipation.

It is very important that the habit of regularity in emptying the bowels is established early in life. It should never be broken. The waste material, faeces, contains millions of bacteria which putrefy the contents and form poisons. If the waste is not promptly removed from the body, the poisons formed will be absorbed into the blood and the whole body will be injured. Headaches, tiredness, weakness and other disorders are the result.

There are two classes of medicines used for constipation; *laxatives*, such as rhubarb, senna, liquid paraffin; and *purgatives*, such as Epsom salts, calomel and castor oil. Laxatives are mild and can be taken without harm. Purgatives are violent and should be taken only rarely. But it is much wiser to select the right food and establish regular habits than to take either.

POISONS

Substances, which, when swallowed and absorbed into the blood, destroy health or even life, are called poison. Sometimes children suck matches, 'taste' disinfectants or eat spoilt food which causes ptomaine poisoning. Sometimes poisons are taken deliberately or accidentally, as in the case of an overdose of medicine. In all such emergencies, it is very necessary that you know how to act immediately. A first aid manual should be kept at hand, for it is impossible to remember the symptoms, antidotes and treatments for all poisons.

What would make you suspect poisoning? Poisoning should be suspected if the following symptoms appear: (1) sudden illness or unconsciousness in a person in good health; (2) the onset of symptoms after eating or drinking.

How can you locate which poison has been the offender? Glance around quickly and see if any bottle or box shows what has been swallowed. Note whether the mouth and clothes have been burnt, as they would be in the case of corrosive poisons. Smell the breath of the patient to know whether carbolic acid, opium or alcohol is the cause. Observe whether the pupils of the eyes are contracted as in opium poisoning, or dilated as with belladonna or *datura*.

What should you do when you suspect poisoning? (1) Send immediately for a doctor, letting him know why he is needed and, if possible, what poison you suspect has been taken. (2) Do not wait for the doctor to arrive, as time means everything. Get your manual of first aid and look up the treatment for the specific poison if you know it. If you do not know the poison, look for the symptoms and judge accordingly. (3) Get rid of the poison from the system. Cause vomiting either by tickling the back of the throat with the finger, or by giving an emetic such as one tablespoonful of mustard in a glass of warm water; or even plenty of plain warm water, if nothing else is at hand. *Do not give an emetic if there are burns on the mouth and lips.* If the poison has burned the mucous membrane during swallowing it will burn it all the more while coming up, if an emetic is given. In such cases, give milk, cooked rice, flour and water or mashed potato, which will soothe the stomach and prevent the poison from being absorbed. (4) Neutralize the poison with an antidote after locating what the poison is. An antidote is something which will counteract the poison. You have learnt what an acid and an alkali are. If the poison is an alkali, give an acid such as lime juice or vinegar. If the poison is an acid, give *chunam*, bicarbonate of soda or plaster. After the antidote has been given, it is usually safe to give an emetic. (5) Stimulate the patient. In many cases of poisoning, there is collapse or drowsiness and the patient will require either warmth to the feet or artificial respiration, or walking to prevent him from going to sleep. Give stimulants, such as hot tea or coffee.

THE CHIEF GROUPS OF POISONS

1. *Narcotics.* Narcotics are poisons which produce sleep, such as opium and its preparations, laudanum, Dover's powders, paregoric, heroin, morphia and chlorodyne. Their symptoms are drowsiness, unconsciousness, accelerated pulse rate followed by weak, slow and shallow breathing, pallor of the face or blueness, clammy perspiration and contracted pupils. The treatment consists of giving an emetic to produce vomiting, followed by a stimulant such as hot, strong coffee. Give a solution of

half a gramme of permanganate of potash to half a litre of water; walk and slap the patient to keep him awake. Repeat the emetic. Give artificial respiration if there is collapse and insensibility.

2. *Irritants*. Irritants include metallic poisons, such as arsenic and mercury and substances such as kerosene oil.

Arsenic poisoning has symptoms which resemble those of cholera. The symptoms are pain in the stomach and abdomen, vomiting, thirst, bowel movements emitting blood, rapid weak pulse, clammy skin and sometimes unconsciousness.

Treatment: Give an emetic of warm salt water; give milk, flax seed, tea or brandy and olive oil. If bowels have not moved, give castor oil.

Apply similar treatment in the cases of poisoning from *kerosene oil, turpentine, and ptomaines.*

Mercury preparations are used as disinfectants and are very poisonous, causing great pain. The symptoms are a metallic taste in the mouth, white, swollen mucous membrane, pain in the abdomen, nausea with vomiting and bloody stools; the skin feels clammy, and there is prostration and collapse.

Treatment: Give an emetic; give the raw white of an egg, or milk or flour and water; give lemonade and brandy.

For *phosphorus*, the treatment is the same as that given for arsenic poisoning except that no oil of any kind may be given.

3. *Corrosives*. Corrosives are strong acids and alkalis which destroy tissues. In this group are sulphuric and nitric acids, and alkalis such as ammonia, caustic soda and potash. The symptoms of *acid* poisoning are burnt lips

and mouth, often stained white, yellow or black; pain in the alimentary tract; intense thirst, vomiting, difficulty in talking and collapse.

Treatment: AVOID EMETICS.

Give whitening plaster of Paris chalk, mixed with water.

Follow this with a quarter litre of olive or sweet oil in half a litre of water.

Give milk freely.

Carbolic acid is different in character and is recognized by its symptoms of a white stain on burnt lips and mouth, and by its odour. The muscles become soft and useless and collapse finally results.

Treatment: AVOID EMETICS.

Give Epsom salts or sulphate of soda (15 g. in a quarter litre of warm water or milk).

Give milk freely or lime water and milk, flax seed tea, or raw eggs, and also alcohol.

Warm the feet and give artificial respiration.

Do not give oil or glycerine, as they hasten absorption of poison.

With *strong alkalis* such as ammonia, caustic soda and potash, the symptoms are vomiting and purging with pain in straining, and collapse.

Treatment: Give lemon or lime juice, or else vinegar diluted with one part of water.

Follow this with soothing drinks of milk or eggs or gruel.

Administer stimulants if there is collapse.

4. *Nerve Poisons.* In this group are prussic acid and cyanide of potassium, cocaine, mushrooms, strychnine, nux vomica, belladonna, *datura*, alcohol, hemp or *bhang*. The substances produce delirium or excitement. The symptoms vary in some particulars;but in general, the pupils

of the eyes are enlarged or dilated. There is giddiness and staggering, followed by insensibility.

Treatment: Give emetics and then stimulants, warmth and artificial respiration.

With mushroom poisoning give a purgative also (5 cl. castor oil).

Assignments

1. What are the qualities essential in a nurse?
2. Give the guiding principles in choosing the room for an invalid.
3. How can bed sores be prevented?
4. What is the normal pulse rate and temperature of a girl of your age?
5. What precautions must be taken before giving medicine?
6. How would you disinfect a room?
7. Practise making a bed.

Have everything ready before beginning. Sheets should be aired and dried well. Place a piece of blanket over the mattress. See that it lies smoothly. Put the bottom sheet on, tuck in both ends. Tuck in well on one side. Then draw the other side tight, and tuck it far under so that there are no wrinkles.

8. Practise changing sheets with someone lying on a bed.
9. Practise moving and lifting a patient in bed.
10. Practise taking temperatures, pulse and respiration.
11. Practise preparing and serving a tray for an invalid.

TABLE OF INFECTIOUS DISEASES

TABLE OF INFECTIOUS DISEASES

DISEASE	CAUSATIVE FACTOR	MODE OF INFECTION	INCUBATION PERIOD	SIGNS AND SYMPTOMS	PATIENT DANGEROUS TO OTHERS	PREVENTIVE MEASURES	SPECIAL TREATMENT
MALARIA	*Plasmodium vivar* .. *ovale* .. *malaria* .. *falaparum*	Mosquito bites	10 to 15 days	Three stages: (1) Cold (2) Hot (3) Sweating	Whenever parasites are in the blood.	Exterminate mosquitoes; sleep under net	Consult doctor. Take quinine daily. Many other synthetic drugs are now available
CHICKEN-POX	Virus	By contact with anyone having the disease	10 to 21 days	Fever, running nose, redness and red pimples. Red pimples rapidly changing to small blisters which appear on 1st and 2nd day. Scabs come and go from 4th day	About 2 weeks or till last scab has fallen	Isolation and disinfection of patient. Prophylaxis: Vaccination against small-pox	Convalescent serum has been suggested as a possible therapeutic measure

CHOLERA	The micro-organisms *Vibrio cholerae*	From excreta; through milk, water, food, dust flies and clothing	A few hours to 5 days	Three stages: (1) Dyspepsia (2) Diarrhoea (3) Vomiting, cramps, watery stools, suppressed urine, collapse	Until stools are free from cholera bacilli organisms	Prophylactic inoculation. Boil drinking water and milk. Avoid eating raw fruit and vegetables	Isolation of the patient, anti-cholera inoculation
DIPHTHERIA	Diphtheria bacilli	Through breath	2 to 10 days	Sore throat, greyish-white patches in the tonsillar area	2 to 3 weeks	Prophylactic inoculation, isolation and disinfection	Anti-toxin injections
DYSENTERY (BACILLARY)	*Shigella* group of organisms	As Cholera	36 hours to 7 days	(1) Diarrhoea (2) Cramps (3) Blood or mucus in stools	As long as the bacilli are in the stools	Isolation & disinfection of excreta	Anti-dysenteric serum
ENTERIC OR TYPHOID	*Salmonella typhosa Salmonella paratyphi*	As Cholera	14 to 21 days	Headache, abdominal pain, rash, high fever. Red elevated rash found on abdomen 7th to 15th day. Rose spots.	8 weeks from first symptoms	As Cholera. Disinfect everything touched by the patient. Inoculate contacts	T. A. B. vaccine

TABLE OF INFECTIOUS DISEASES—*contd.*

DISEASE	CAUSATIVE FACTOR	MODE OF INFECTION	INCUBATION PERIOD	SIGNS AND SYMPTOMS	PATIENT DANGEROUS TO OTHERS	PREVENTIVE MEASURES	SPECIAL TREATMENT
INFLUENZA	Virus	Through breath and clothing	1 to 4 days	Running nose, cold, aching limbs and body	2 to 6 weeks according to type	Strict isolation. Good ventilation	Use of serum
HYDRO-PHOBIA	Virus	Bites from infected animals—dogs and jackals	7 days to two months or even a year	Terror of water. Restlessness. Difficulty in swallowing. Spasms of throat and respiratory muscles	Animal that bit patient should not be destroyed, for 10 days	Cauterization of bites with nitric or carbolic acid	Preventive inoculation
MEASLES	Virus	By breath	1 to 2 weeks	Severe cold. Rash. Eyes congested. Dull redness behind ears, on face	3 weeks	Distinfection and isolation	Care of eyes and kidneys
MUMPS	Virus	Direct contact	14 to 21 days	Painful swellings behind angles of jaws	2 weeks or till swelling subsides	Disinfection and isolation	Convalescent serum

PLAGUE	Pasteurella pestis	From rats, through fleas	3 hours to 15 days. Usually 2 to 8 days	Three types: (1) Bubonic (enlarged painful gland) (2) Septicemic (3) Pneumonic	6 to 8 weeks	Inoculation, Isolation, disinfection, eradication of rats.	Serum and vaccine
PNEUMONIA	Virus, bacteria	Through air, sputum, food	16 hours to 5 days	*Rigors*, cough, headache, rusty sputum. Crisis about 15th day. Herpes around nose is common	15 days	Isolation and careful disinfection	Penicillin and other antibiotics
SMALL-POX	Virus	Through air, from skin and clothing	10 to 14 days	Small red pimples, becoming pocks, appear on 3rd day. High temperature which rises when pus appears in pocks. Scabs appear from 9th and 10th day and begin falling on 14th day.	As Chicken-pox	All persons coming in contact with case must be vaccinated	Serum

TABLE OF INFECTIOUS DISEASES—*contd.*

DISEASE	CAUSATIVE FACTOR	MODE OF INFECTION	INCUBATION PERIOD	SIGNS AND SYMPTOMS	PATIENT DANGEROUS TO OTHERS	PREVENTIVE MEASURES	SPECIAL TREATMENT
SCARLET FEVER	*Streptococcus hemolyticus*	By breath, mucus discharge, clothing, books and scales from skin	2 to 7 days	Cheeks look as if painted. Pale circle around the mouth. Generally high fever. On 2nd day bright scarlet markings on chest. Fades on 5th day of fever.	Until peeling has ceased	Isolation and disinfection	Passive inmunization
TUBERCULOSIS OR CONSUMPTION	Tubercle bacilli, *Mycobacterium tuberculosis*	Through air from sputum or milk	Uncertain	Indigestion, fever, wasting, debility, cough, haemorrhage from lungs	Throughout the disease in pulmonary cases	Isolation. Disinfection of sputum, clothing. Examine sources of milk supply	Sunshine, fresh air, good diet, Cod-liver oil. Anti-tuberculosis drugs
WHOOPING COUGH	*Haemophilus pertussis*	Through breath or clothing	4 to 14 days or longer	Coughs until blue in face, then whoops, vomiting after coughing. Attacks occur 4 or 5 times daily	6 to 8 weeks	Isolation, disinfection of sputum, clothing etc.	Vaccine

CHAPTER XXXI

FIRST AID

SLINGS AND BANDAGES

Everyone should know how to fold and apply a triangular bandage (Figure 103) and how to put on an arm sling

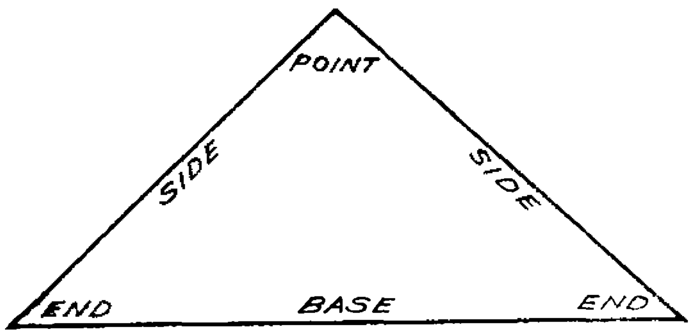


FIG. 103. Triangular bandage

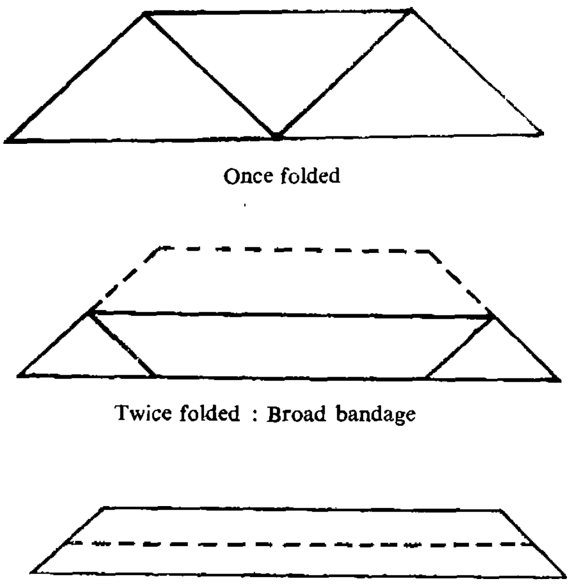
(Figure 104). A metre square of strong cotton cloth cut diagonally across from corner to corner will form two bandages; or a large handkerchief may be folded and used without cutting. It may be used as an arm sling when there is injury to the hand, or when the arm necessitates its being raised to prevent the flow of blood downwards. In order to put on a sling, place one end to as to hang a few centimetres over the front of the shoulder on the injured side. Take the bandage behind the neck, bring it over the other shoulder, spread it out on the chest with its point towards the elbow of the injured arm. Bend the arm on the middle of the bandage. Bring the hanging end outside the injured arm up to the other end hanging over the front shoulder and tie the two ends with a reef knot. With two safety pins, secure the point at the elbow to the bandage on the outside.

FIG. 104. Arm sling

By folding the triangular bandage with its point to the base and then folding it in two, as in Figure 105, a broad bandage is obtained. If folded in three, a medium bandage is obtained. By folding a broad bandage into two, a narrow bandage is obtained. The broad bandage may be used for a sling, instead of the unfolded triangle.

BROKEN BONES: FRACTURES

If anyone falls and breaks a bone, the broken ends must be put closely together and held in that position. Otherwise they cannot knit together again. If the patient has to be moved, care must be taken not to displace the broken ends



Once folded

Twice folded : Broad bandage

Broad bandage twice folded : Narrow bandage

FIG. 105. Folding a triangular bandage

nor allow them to lacerate the flesh. If the skin is broken, apply an antiseptic to prevent the entrance of puss forming bacteria.

There are many kinds of fractures. Accordingly special methods of bandaging must be applied to the position of the broken bone. Wrap a bandage around the broken limb. Then place splints around it and tie them to the limb to keep it straight and steady (Figure 106).

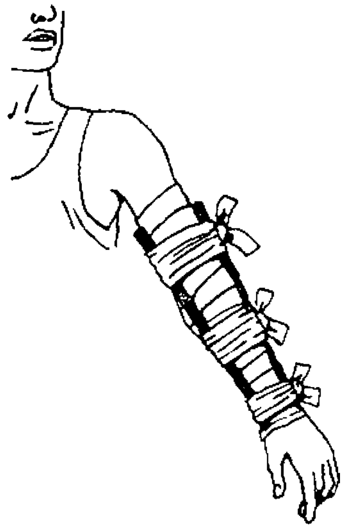


FIG .106. Broken bone setting

If nothing is available, strap the broken leg to the uninjured leg, or the broken arm to the side of the body. Slip a blanket carefully under the patient; place two poles on either side and tie the blanket to, or roll the edges round the poles. A stretcher is thus formed. Carry the patient home on this stretcher. Keep his broken limb straight until the doctor comes or the patient reaches the hospital.

DISLOCATION

When a bone gets out of place it is usually because the ligaments have been broken around the joint. It takes a skilful person like a physician to put it back into its place. Call a doctor at once to do this before the joint becomes more swollen. The bone must be kept in place. Remove the clothing and place the limb on a pillow and apply a cold water dressing. If that does not relieve the pain, apply a hot cloth. Keep the patient warm. The limb must be bandaged.

SPRAINS

The most common form of sprain occurs when an ankle is turned too far, thus pulling the ligaments away from the bone. It heals when new ligaments form taking the place of the broken or torn ones, but it often takes a long time. Treat sprains as you would treat dislocations. Stroke the injured part, pressing the blood up towards the body. Bandage carefully and exercise as soon as the pain stops. Otherwise the joint will become stiff.

BLEEDING

The fresh blood with new oxygen in the red corpuscles comes away from the heart through the arteries and, therefore, its colour is bright red. In contrast, the blood in the veins, having lost its oxygen, appears dark. The heart pumps the blood into the arteries in jumps. With each beat of the heart the blood jumps into the arteries. However, the blood flows steadily in the veins.

When any type of bleeding occurs, send for the doctor at once. In the meanwhile, if an artery is cut, it would be necessary to stop the flow from the direction of the heart. If a vein is cut, control the flow from the direction farthest from the heart. How can this be done? First stop the bleeding by pressing hard with your finger above the cut. If it is an artery, tie a cloth tightly around the limb, between the cut and the heart, if possible, where an artery passes over a bone. Make a knot with the cloth so that it will lie on top of the artery. If this is not sufficient, put a pad or a coin under the knot. To make the binding very tight, put a stick through the cloth and twist it. A bandage thus twisted tight is called a *tourniquet* (Figure 107). Do not let a tourniquet stay for more than twenty minutes without loosening it for a moment. Raise the part of the body that is bleeding. When you loosen the tourniquet, press your finger over the artery to keep it from bleeding. Tie the tourniquet again until the doctor comes. The treatment for a bleeding vein is similar. The only difference is that the pressure should be on the part farthest from the heart, between the extremities and the wound.

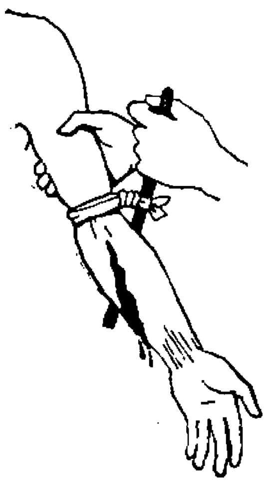


FIG. 107. Tourniquet

Internal bleeding, called *internal haemorrhage*, needs the immediate attention of a doctor. Till the doctor comes, keep the patient lying flat, undo all the tight clothing, give fresh air and fan him. Give ice to suck or cold water to drink. Apply an ice bag locally if the seat of the injury is known. If the patient faints rectify that with suitable treatment, but give no stimulant to drink.

Although the blood vessels in the skin respond very readily to changes of temperature, heat or cold tend to coagulate the blood and check its flow. The application of slight warmth on the skin brings the blood to the surface while the application of cold drives it to the internal organs. That is why in headaches and sprains, where the pressure of excess blood causes heat and pain, we apply ice. On the other hand, where pain is felt internally, we apply hot fomentations to draw the blood to the surface. When the skin is exposed to sudden chills, the blood rushes inwards, and sometimes sets up inflammation which brings about a condition favourable to the development of a cold. Under such situations, a hot mustard bath for the feet will draw the blood downwards from the overheated internal regions and help to check the cold.

If the nose bleeds, do not let the patient lie down but keep his head up. Let him sit in front of the window with arms up and get someone to hold them so. He must breathe through his mouth instead of the nose. Place a cold, wet cloth (ice is better) over his nose and also at the back of his neck. Place his feet in hot water. Sometimes bleeding will stop, if he puts a wad of paper between his upper lip and teeth, and then presses on the outside. In small cuts, the bleeding is stopped by the clotting of the blood. Do not let the patient wash away the clot or blow his nose. Then the bleeding will begin again. He can stop the nose from bleeding by compressing the nose between the finger and thumb for ten minutes.

CHOKING

Sometimes, in the act of swallowing food, a person laughs or coughs, thus letting the food slip past the epiglottis and enter the trachea, instead of the oesophagus. This causes him to 'choke'. Usually a thump on the back, with the head forward and arms lifted, will be sufficient to dislodge the obstruction. Coughing will sometimes bring it up. If the choking persists, let him force the forefinger as far down the throat as possible and pull out the obstacle but avoid forcing it further down.

If a child swallows an article, such as a button, that sticks in his throat, hold him upside down and slap him on the back. Sometimes you can pull the article out with forceps. If breathing ceases, try artificial respiration and send for the doctor at once.

ASPHYXIA

People drown because water cuts off the air from their lungs. Therefore, in any case of drowning, our aim must be to get air into the lungs as quickly as we can. First, drain the water from the lungs by lifting the patient, face down, and jerking the body repeatedly and quickly as shown in Figure 108. A heavy person may be rolled over a barrel.

FIG. 108. Expelling water

The next step is to fill the lungs with air. Act quickly and make a pillow of anything available and lay the patient face down, with the pillow under his chest. Loosen his garments at the neck

FIG. 109. Artificial respiration

and waist. Start artificial respiration (Figure 109). Stand or kneel astride the patient and place your hands over his lower ribs on each side. Press down steadily, with the weight of your body on your hands, to drive the air out of the lungs. Then relax the pressure without removing your hands, thus allowing the air to come into the lungs again. Again press the air out, and again remove the pressure, but not the hands. Repeat this action fifteen times a minute and keep it up until the patient revives. Do not give up hope for two hours at least.

If there is someone to help, let him rub the limbs along the veins, in the direction of the heart, thus forcing the blood to circulate. Keep the body warm in all the ways possible, with blankets, hot water bottles, hot stones wrapped in cloth, or hot sand in a bag. Place one at the head but avoid having the bag too hot.

When the patient begins to revive and can swallow, let him drink strong hot coffee. A little alcohol, or sweet spirits of ammonia in water are good stimulants. Change his clothing and keep him warm.

In the case of *suffocation*, the same trouble exists—lack of oxygen in the lungs—and therefore artificial respiration is necessary. Whenever breathing ceases, by reason of shock, asphyxiation or choking, try restoration by artificial respiration.

When poisonous gases have been inhaled, remove the patient to fresh air. Sprinkle cold water on his face.

ELECTRIC SHOCK

If the patient is touching a wire or an electrified rail, cut off the source of electricity immediately. If not, remove the patient. The human body is a conductor of electricity so that your body touching the patient's body while touching the source will immediately become electrified. Thus, far from helping the patient, you will fall unconscious and need help yourself. Therefore, stand on wood or a dry coat, a rubber mat, or some layers of dry newspaper, and push his body away with a dry stick, or pull it away quickly with your hands thickly covered with some dry, non-conducting material like rubber, dry cloth or newspaper. If you want to cut the wire, cut on both sides of the patient with an axe which has a dry wooden handle. When the patient is disconnected from the source of the electric current, you can handle him without danger. Then, give artificial respiration if needed.

A person struck by lightning should be treated at once with artificial respiration. Sometimes pouring buckets of water on the bodies of lightning-struck animals helps in their recovery.

In all cases when artificial respiration has been tried, smelling salts may be applied to the nose and the chest, flicked with a damp cloth.

Assignments

1. What would you do if your clothing caught fire?
2. How would you stop nose-bleeding?
3. Practise various bandages and dressings for burns, bites, stings and fractures.
4. Apply tourniquets at different points to arrest haemorrhage.
5. Practise giving artificial respiration.

RECIPES

1. CEREAL PREPARATIONS

Fried Rice (For 4 servings)

450 g. pulao rice	115 g. onion
900 g. boiling water	2 g. cloves
3 g. cinnamon	2 g. cardamom
55 g. fat or oil	5 g. salt

METHOD:

1. Clean and soak the rice for 1 hour and drain.
2. Peel and slice the onions into small pieces.
3. Heat the fat or oil in a *degshi* to smoking stage.
4. Add the cloves, cinnamon and onions and fry.
5. Add the soaked drained rice and stir for 10 minutes.
6. Add the boiling water and let the mixture boil for 30 minutes, stirring.
7. Lower the flame to finish off.
8. Serve hot with chutney or curry.

Lime Rice (For 4 servings)

450 g. raw or parboiled rice	30 g. oil
15 g. black gram *dhal*	15 g. Bengal gram *dhal*
30 g. cashewnuts	5 g. mustard
30 g. groundnuts	2 g. fenugreek seeds
Lime juice squeezed from 2 limes	1 g. turmeric powder
	5 g. salt

900 g. water	2 red chillies (whole)
A few curry leaves	A pinch of asafoetida

METHOD:

1. Clean and cook the rice.
2. Roast fenugreek and black gram and powder.
3. Mix rice with powdered fenugreek and black gram. Add salt and lime juice.
4. Heat the oil to smoking stage and add mustard, red chillies, curry leaves and Bengal gram.
5. Add the fried mixture to the rice and mix. Add the fried nuts and serve hot.

Coconut Rice (For 4 servings)

450 g. raw or parboiled rice	115 g. coconut
115 g. fat or oil	55 g. onion
10 g. salt	2 g. turmeric
2 g. cinnamon	5 g. cardamom
5 g. cloves	900 g. water

METHOD:

1. Clean and soak the rice for half an hour. Drain.
2. Scrape and grind the coconut.
3. Add 100 g. of water.
4. Obtain the milk of coconut.
5. Heat fat and dry the spices, sliced onion till brown.
6. Add drained rice.
7. Add remaining water, coconut milk and salt.
8. Cook the rice till grains are separate.
9. Serve hot.

Curd Bhath (For 4 servings)

450 g. raw or parboiled rice	225 g. curd (thick)

200 g. milk	5 g. salt
5 g. green chillies	5 g. ginger
2 g. mustard seeds	200 g. raw green mango
30 g. oil	900 g. water
A pinch of asafoetida	A few curry leaves

METHOD :

1. Clean and boil the rice and keep aside.
2. Beat curd.
3. Add salt to the beaten curd.
4. Peel the mango.
5. Chop into fine pieces the green chillies, ginger and peeled mango.
6. Add the chopped ingredients to the curd.
7. Heat oil. Add mustard seeds, asafoetida and curry leaves.
8. Add the fried ingredients into the beaten curd.
9. Mix the rice with the curd mixture.
10. Add the milk and mix well.
11. Serve with chutney or pickles.

Tamarind Rice (For 4 servings)

400 g. parboiled rice	50 g. tamarind
50 g. black gram *dhal*	50 g. Bengal gram *dhal*
20 g. red chillies	150 g. gingili oil
2 g. peppercorns	2 g. mustard
2 g. turmeric	1 g. asafoetida
1 g. green chillies	5 g. ginger
5 g. salt	900 g. water
A few curry leaves	

METHOD:

1. Clean and cook the rice in 800 g. water with salt.
2. Extract the juice from tamarinds by adding 100 g. water.

3. Roast the black gram *dhal*, Bengal gram *dhal* and red chillies separately.
4. Grind the roasted black gram *dhal*, Bengal gram and red chillies to a coarse powder.
5. Add asafoetida, mustard, peppercorns, turmeric, green chillies, ginger and chopped curry leaves to the heated oil.
6. As soon as mustard seeds burst, add tamarind extract, powdered *masala* and salt. Cook till the mixture thickens.
7. Mix the tamarind *masala* with rice. Serve hot.

Vangi Bhath (For 4 servings)

450 g. raw or parboiled rice	
300 g. *brinjal*	
50 g. oil	30 g. tamarind
A pinch of salt	1000 g. water

For *masala* :

10 g. chilli powder	120 g. black gram
120 g. black gram *dhal*	2 g. turmeric
10 g. mustard	5 g. asafoetida
5 g. coriander seeds	2 g. pepper
8 g. cumin seeds	

METHOD:

1. Clean and cook the rice in 900 g. water.
2. Roast the *masala* ingredients and powder them.
3. Extract tamarind juice with 100 g. of water.
4. Wash and cut the *brinjals* into halves.
5. Fry *brinjal* in oil, add *masala* powder, tamarind juice and salt.
6. Add the mixture to the rice and mix well.
7. Serve hot.

Ven Pongal (For 4 servings)

450 g. raw or parboiled rice	225 g. green gram *dhal*
30 g. cashew nuts	10 g. pepper
3 g. cumin	10 g. ginger
115 g. *ghee* or hydrogenated fats	1000 g. water
	A pinch of salt

METHOD:

1. Fry cashew nuts till golden brown in *ghee* or hydrogenated fats.
2. Separately fry the pepper, cumin seeds, and lightly fry green gram *dhal.*
3. Clean and wash the rice.
4. Boil the water and add fried *dhal*, pepper, cumin and rice.
5. Chop ginger.
6. Add salt and chopped ginger to rice when it is half cooked.
7. When well cooked add cashew nuts and serve with coconut chutney.

Tomato Bhath (For 4 servings)

450 g. parboiled rice	1000 g. tomatoes
120 g. onion	25 g. coriander leaves
50 g. fat	10 g. garlic
6 g. ginger	4 g. pepper
3 g. cloves	1000 g. water
A pinch of salt	

METHOD:

1. Cook the tomatoes in 500 ml. water for four minutes.
2. Mash and strain.
3. Grind garlic and ginger and mix with tomato.

4. Slice onions and fry till golden brown.
5. Add cloves, pepper and rice and fry well.
6. Add remaining water, tomato juice and salt.
7. Cook the rice till soft.
8. Add chopped coriander leaves and fried onions and serve hot. (Sliced boiled eggs can also be added along with tomato bhath.)

Chapatis (For 4 servings)

450 g. *atta*	10 g. salt
30 g. rice flour	20 g. *ghee*
150 g. water	

METHOD:

1. Sift flour.
2. Add salt and water to flour and make a dough.
3. Keep aside for about 30 minutes.
4. Knead well and divide into small balls.
5. Roll using flour.
6. Cook on both sides on hot *tawa*.
7. Place the cooked *chapati* over coal and allow to puff.
8. Smear with *ghee* and serve hot.

Parathas (For 4 servings)

450 g. *atta*	115 g. *ghee* or fat
5 g. salt	100 g. water

METHOD:

1. Sift flour.
2. Add salt and water to flour with a little amount of fat.
3. Keep aside for at least half an hour for gluten formation.

4. Knead well. Divide into small balls.
5. Roll out the balls flat $\frac{1}{4}''$ thick.
6. Smear with *ghee*, fold into two and roll out into round or triangular shapes.
7. Heat *tawa* and pan-fry parathas on both sides. (Part of the *atta* flour can be substituted with *cholam* or Bengal gram *dhal* flour).

Vegetable Pulao (For 4 servings)

450 g. *pulao* rice	120 g. beans
120 g. peas	220 g. carrots
120 g. tomatoes	60 g. cauliflower
100 g. *ghee* or fat	120 g. onion
5 g. cloves	5 g. cardamom
5 g. pepper	5 g. cinnamon
1000 g. water	A pinch of salt

METHOD:

1. Clean carrots and beans and cut into thin long pieces.
2. Cut cauliflower into flourettes.
3. Shell peas.
4. Slice onions and fry till crisp.
5. Clean, wash and drain rice.
6. Fry vegetables slightly and remove.
7. Fry spices and rice.
8. Add hot water and cook.
9. When the rice is three-fourths cooked, add vegetables in the centre, cover and cook on a low fire.
10. Cook till tender, mix well and serve hot. Instead of all the vegetables, peas and tomatoes alone can be used in the preparation of *pulao*.

Adai (For 4 servings)

250 g. raw rice	50 g. Bengal gram *dhal*
50 g. green gram *dhal*	50 g. red gram *dhal*
30 g. cow gram	20 g. black gram *dhal*
100 g. gingili seeds oil	100 g. onion
500 g. water	30 g. chillies
A pinch of salt	A few curry leaves
A few coriander leaves	

METHOD:

1. Soak rice and pulses in water for 2 hours. Drain.
2. Grind them together with onion, chillies, curry leaves and coriander leaves.
3. Add salt and mix.
4. Heat *tawa* and prepare *adai*.

Stuffed Parathas (For 4 servings)

1000 g. wheat flour	280 g. horse-radish
Salt to taste	60 g. butter

METHOD:

1. Sieve the flour and salt together.
2. Blend in 60 g. butter and make into a soft dough with cold water.
3. Divide into 32 parts.
4. Grate the horse-radish.
5. Roll out each piece thinly and round in shape.
6. Spread the horse-radish on one round and cover with another.
7. Make 16 stuffed parathas altogether.
8. Fry in the rest of butter.

9. Cook using gentle flame.
   (All types of mashed, boiled or grated vegetables can be used instead of horse-radish)

2. PULSES

Whole Gram Curry (For 4 servings)

200 g. whole green gram	50 g. greens
25 g. tamarind	2 g. green chillies

Seasoning:

2 g. black gram *dhal*	2 g. mustard
2 g. red chillies	6 g. fenugreek
20 g. hydrogenated fat or oil	10 g. rice flour
A pinch of asafoetida	

METHOD:

1. Cook the soaked *dhal*.
2. Chop greens and green chillies.
3. Extract tamarind juice.
4. Add the *dhal*, greens and tamarind with salt and boil well.
5. Serve hot.

Dhal Kootu (For 4 servings)

250 g. red gram *dhal*	100 g. tomatoes
10 g. green chillies	20 g. oil
20 g. onion	10 g. coriander leaves
5 g. salt	2 g. turmeric
2 g. asafoetida	

Seasoning:

2 g. dry chillies	3 g. mustard
3 g. black gram *dhal*	A few curry leaves

METHOD:

1. Cook the *dhal* with turmeric powder, asafoetida and 10 g. of oil in 200 g. of water.
2. When the *dhal* gets cooked remove the water and keep aside.
3. Mash the *dhal* to a paste.
4. Blanch the tomatoes by putting them in boiling water for a minute.
5. Add the tomatoes to the *dhal* and mash well.
6. Add onion, green chillies and salt in the water used for cooking *dhal* and boil.
7. Heat oil and add the mustard, black gram *dhal*, dry chillies and finally onion.
8. When the black gram *dhal* turns brown add curry leaves and the *dhal*.
9. Keep on the fire for 5 minutes.
10. Remove from fire and serve hot.

Sambar (For 4 servings)

115 g. red gram *dhal*	115 g. drumstick
115 g. lady's finger	115 g. onion
30 g. coconut	3 g. red chillies
30 g. coconut oil	15 g. coriander seeds
4 g. cumin seeds	2 g. turmeric
4 g. mustard	2 g. fenugreek
15 g. tamarind	A sprig of curry leaves
A pinch of asafoetida	A pinch of salt

METHOD:

1. Wash *dhal* and boil in water with turmeric powder.
2. Wash and cut drumstick and lady's finger into even-sized pieces. Slice onions.

3. When *dhal* is tender add vegetables.
4. Lightly fry in a little oil coriander seeds, cumin seeds, fenugreek, asafoetida and three-fourths of the red chillies. After a few minutes add scraped coconut. Remove from fire when coconut gets browned.
5. Grind *masala* and coconut to a fine paste.
6. Soak tamarind in hot water and extract juice.
7. When vegetables are cooked add ground ingredients.
8. Bring to boil.
9. Add tamarind juice and simmer for a few minutes. Remove.
10. Heat remaining oil and fry mustard seeds, broken red chilli pieces and curry leaves.
11. When mustard seeds crackle pour into the *sambar*. Mix well.

3. VEGETABLES

Bhindi (*Poriyal*) (For 4 servings)

450 g. lady's finger
3 g. turmeric powder
3 g. chilli powder
5 g. salt
8 g. coriander seeds powder
2 g. green chillies
50 g. oil

METHOD:

1. Wash lady's finger and green chillies.
2. Cut the lady's finger into small pieces.
3. Cut green chillies.
4. Heat the oil.
5. Add the lady's finger, green chillies, turmeric powder, chilli powder, coriander seeds and salt.
6. Stir well and keep covered.

7. Cook over gentle heat for 25 minutes.
   (Cauliflower, cabbage, amaranth, carrot and peas can be used in this preparation).

Cabbage Thoran (For 4 servings)

150 g. cabbage	100 g. coconut
5 g. green chillies	10 g. onion
2 g. turmeric	1 g. cumin seeds
2 g. garlic	2 g. mustard
250 g. water	A few curry leaves
A pinch of salt	

METHOD:

1. Wash and shred cabbage like grated coconut.
2. Grate coconut fine.
3. Grind turmeric, green chillies, cumin seeds, onion and garlic to a fine consistency.
4. Add coconut and mix on the stone till well blended.
5. Cook cabbage with salt and water.
6. Add coconut mixture and curry leaves. Do not mix.
7. Cover and cook for about 5 minutes on a slow fire to allow steam to go through coconut mixture and curry leaves.
8. Stir with wooden spoon and mix.
9. Remove from fire after 3 minutes. It should be completely dry.
10. Heat the oil and add finely chopped onion. When they become brown add mustard seeds.
11. Add cabbage mixture.
12. Fry for about 2 to 3 minutes.
13. Remove and serve hot or cold.
    (Amaranth can be used in this preparation.)

Onion Bajee (For 4 servings)

450 g. onion
4 g. turmeric
8 g. coriander seeds powder
500 g. oil
A pinch of salt
5 g. ginger
4 g. chilli powder
8 g. vinegar or lime juice

METHOD:

1. Heat the oil.
2. Add sliced onion, sliced ginger, dry *masala* and salt.
3. Cook on a slow fire for about 20 minutes.
4. Add vinegar or lime juice.
5. Continue cooking for a further 5 minutes.

Mixed Vegetable Bhujjia (For 4 servings)

225 g. potatoes
115 g. peas
115 g. onion
6 g. turmeric
6 g. garlic
500 g. water
A pinch of salt
115 g. cabbage
115 g. tomatoes
10 g. lime juice
4 g. *jeera*
30 g. *ghee* or hydrogenated fat

METHOD:

1. Wash and cut the vegetables.
2. Heat *ghee* and fry *masala.*
3. Add the vegetables and salt. Mix well.
4. Cover the pan with a well fitting lid.
5. Cook gently shaking the pan frequently to stop burning.
6. Add water if necessary.

7. Cook till all vegetables are properly cooked.
8. Add lime juice and remove.
   (Cauliflower can be used in this preparation.)

Stuffed Brinjal (For 4 servings)

Base:	225 g. potatoes
225 g. *brinjal*	15 g. butter
Filling:	15 g. milk
115 g. potatoes	*Garnish:*
115 g. peas	10 g. tomatoes
115 g. carrots	30 g. hydrogenated fat to dry (absorption)
55 g. onions	200 g. water
5 g. green chillies	A pinch of salt
Coating:	
55 g. basen (gram flour)	

METHOD:

1. Pre-boil *brinjal*. Cut into two, lengthwise. Scoop out centre.
2. Cut vegetables and onion. Shell peas. Chop green chillies. Boil vegetables and chillies in just enough water to cook. Add salt.
3. Heat a little fat. Sautè scooped centre of *brinjal*. Add vegetables and mix well.
4. Stuff *brinjal* with filling.
5. Prepare a batter with basen and water. Add salt.
6. Coat *brinjals* and deep fry. Remove and drain.
7. Boil and mash potatoes.
8. Pipe a border of mashed potatoes on a flat dish. Arrange *brinjals* in the centre.
   (*Tinda* can be used in the preparation.)

Fried Karela or Pevakkaulathivathu (For 4 servings)

225 g. bitter gourd
10 g. coconut flesh
A pinch of salt
10 g. green chillies
15 g. coconut oil

METHOD:

1. Wash gourd and dry.
2. Slit and remove seeds and pulp.
3. Cut into fine slices and roundels.
4. Cut green chillies.
5. Cut coconut into fine $\frac{1}{4}''$ pieces.
6. Cook together gourd, green chillies and coconut with just enough water to cook gourd dry.
7. Cook over gentle heat till gourd is done and water evaporated.
8. Heat oil in a frypan.
9. Add cooked gourd and fry till gourd is fairly crisp.

Greens Maseel (For 4 servings)

300 g. greens
5 g. mustard
20 g. groundnut oil
A pinch of salt
15 g. green chillies
5 g. black gram *dhal*
50 g. coconut scrapings

METHOD:

1. Cook the washed greens.
2. Mash.
3. Season mustard and black gram *dhal*.
4. Add this to the mashed greens.
5. Add coconut scrapings and salt.
6. Mix well and serve.

Vegetable Salad (For 4 servings)

22 g. fresh cabbage	55 g. onion
5. g. green chillies	25 g. coriander leaves
30 g. groundnut oil or salad oil	1 lime
A pinch of salt	

METHOD:

1. Shred cabbage fine.
2. Chop green chillies, onions and coriander leaves.
3. Mix all ingredients together.
   (Carrot, cucumber, beetroot and onion can be used in this preparation.)

4. CURRIES

Pagara Baingan (For 4 servings)

450 g. *brinjals*	115 g. coconut
225 g. onions	115 g. tamarind
15 g. coriander seeds	5 g. red chillies
30 g. garlic	15 g. *ghee*
5 g. mustard	5 g. *jaggery*
5 g. green chillies	5 g. gingili oil
A pinch of salt	A few curry leaves

METHOD:

1. Wash *brinjal* without breaking the stem, cut them lengthwise in quarters.
2. Heat the oil and fry *brinjal* till the skin turns a brownish colour.
3. Remove and keep aside.
4. In the same oil fry the coriander seeds, chillies, and

onions. Grind fried spices with coconut and garlic.

5. Roast gingili seeds separately and powder.
6. Soak tamarind and extract pulp.
7. Add to ground spice.
8. In the remaining oil fry *masala* well.
9. Add *brinjal* and gingili powder.
10. Cover and cook till gravy thickens.
11. Add *jaggery*.
12. When gravy is quite thick remove from fire.
13. In another pan put *ghee*. Add mustard seeds and curry leaves.
14. When mustard seeds crackle pour over the curry, mix well and serve.

Mixed Vegetable Curry (For 4 servings)

115 g. cauliflower	115 g. potatoes
30 g. carrots	115 g. peas
115 g. tomatoes	30 g. onion
5 g. chilli powder	10 g. coriander powder
10 g. tamarind	2 g. turmeric powder
5 g. garlic	5 g. ginger
5 g. green chillies	5 g. dried coconut

METHOD:

1. Prepare vegetables.
2. Slice onions and green chillies.
3. Grind together coriander powder, chilli powder, garlic, ginger and dried coconut.
4. Heat oil and fry *masala*.
5. Add prepared vegetables except tomatoes, sliced onion and green chillies. Fry for 5 minutes.

6. Add chopped tomatoes, sliced ingredients, salt and a little water if necessary and cook on a low fire till vegetables are cooked.
7. Soak tamarind in a small quantity of water and add to cooked vegetables.
8. Bring to boil, simmer for a few minutes and remove.
   (Beans, cabbage and pumpkin can be used in this preparation.)

5. MEAT AND MEAT PRODUCTS

Mutton and Potato Curry (For 4 servings)

500 g. mutton	225 g. potato
115 g. onion	30 g. coriander powder
30 g. tamarind	30 g. *ghee*
6 g. garlic	5 g. green chillies
6 g. turmeric	10 g. chilli powder
10 g. ginger	500 g. water

METHOD:

1. Wash and cut up the meat.
2. Wash, peel and cut the tomatoes.
3. Slice onion, peel and slice half the garlic and ginger.
4. Soak tamarind in 100 g. of water.
5. Grind remaining half of garlic and ginger.
6. Heat *ghee* and fry onion, sliced garlic, ginger and whole chillies.
7. Add turmeric, coriander powder and chilli powder.
8. Fry well, sprinkling water from time to time.
9. When well fried add meat and fry for 5 minutes.

10. Add potatoes and salt with warm water.
11. Cook gently till meat is tender.
12. Add tamarind water, bring to boil and remove from fire.
    (Eggs can also be used along with mutton in the preparation.)

Mutton Khorma (For 4 servings)

500 g. mutton	230 g. onion
55 g. fat	30 g. dried coconut (copra)
5 g. ginger	5 g. red chillies
15 g. coriander powder	10 g. poppy seeds
10 g. cinnamon	3 g. cloves
3 g. peppercorns	3 g. cardamoms
2 g. green chillies	8 g. garlic
500 g. water	

METHOD:

1. Wash and cut meat.
2. Soak in curd for half an hour.
3. Grind together poppy seeds, copra, garlic, ginger, coriander powder, red chillies, green chillies, and half the onion.
4. Heat fat, fry remaining onion.
5. Add ground *masala* and meat. Fry for about 15 minutes.
6. Add remaining curd and tepid water and cook till meat is tender.
7. Add cinnamon, cloves, peppercorns and cardamom roasted and powdered.
8. Cook for 5 to 10 minutes more and serve hot.

Fried Meat (For 4 servings)

500 g. mutton	225 g. onion
115 g. potatoes	115 g. tomatoes
115 g. carrots	30 g. vinegar
5 g. red chillies (without seeds)	10 g. ginger
2 eggs	115 g. oil
500 g. water	30 g. bread crumbs

METHOD:

1. Grind chillies, ginger and garlic to a fine paste.
2. Clean and cut meat, potatoes and carrots into even-sized cubes. Chop onions.
3. Boil meat with vinegar, half the oil and salt. When half done add ground *masala* and cook till tender.
4. Fry potatoes and carrots in oil.
5. With fine sticks (5" long) thread onions, potatoes, meat, carrot and raw tomatoes alternately.
6. Beat the eggs. Dip sticks in egg, sprinkle with bread crumbs and deep fry.

Mutton Cutlets (For 4 servings)

500 g. leg of mutton	115 g. potatoes
53 g. onions	53 g. bread crumbs
5 g. pepper	10 g. salt
1 egg	5 g. ginger
10 g. green chillies	1 lime
20 g. coriander leaves	30 g. fat to fry (absorption)

METHOD:

1. Mince the mutton.
2. Boil and mash potatoes.

3. Chop onion, coriander leaves, green chillies and ginger; mix together all the ingredients and seasoning.
4. Form into balls and flatten.
5. Coat with egg and bread crumbs.
6. Deep fry and serve hot.

N.B. Chopped ingredients may be lightly sautèd in a little fat before adding to the rest of the ingredients.

Chicken Curry (For 4 servings)

1 chicken (about 1.36 kg.)	225 g. onion
6 g. garlic	15 g. coriander powder
2 g. turmeric	10 g. ginger
6 g. cumin	250 g. fat

METHOD:

1. Clean, wash and joint chicken.
2. Slice onion and garlic.
3. Grind together coriander, turmeric, ginger, cloves and cumin.
4. Heat fat. Fry sliced onion. Add chicken pieces and brown.
5. Add chopped garlic and ground *masala.*
6. Fry for 2 to 3 minutes.
7. Add chopped tomatoes, beaten curd, salt and a little water if required.
8. Simmer till chicken is cooked.

Chicken Stew (For 4 servings)

1 chicken (medium sized)	225 g. onion
450 g. potatoes	20 g. green chillies

10 g. ginger
1000 g. water
A pinch of salt
1 coconut
A few curry leaves

METHOD:

1. Clean and joint chicken.
2. Peel and quarter onions and potatoes.
3. Peel and slice ginger.
4. Slit green chillies.
5. Make three extractions of coconut milk (thick, medium and thin).
6. In a pan put the chicken, onion, ginger, green chillies, curry leaves and salt.
7. When potatoes are cooked add flour mixed in a little coconut milk (second extraction of coconut milk can be used).
8. Cook till gravy is thick. Add first extraction of coconut milk.
9. Bring to boil and remove.
10. Heat *ghee.*
11. Add sliced onions and slightly crushed cinnamon and cloves. When brown pour over stew. Mix well.

Fried Chicken (For 4 servings)

1 chicken (medium sized)
1 g. red chillies
3 g. cinnamon
A pinch of salt
5 g. pepper
2 g. turmeric
60 g. oil to fry

METHOD:

1. Clean and joint chicken.
2. Grind together red chillies, pepper, turmeric, cinnamon and salt.

3. Smear over chicken.
4. Put chicken in a pan and cook with just sufficient water to cook it tender but dry.
5. Heat oil. Fry pieces of chicken (both sides).
6. Serve hot or cold.

Liver Fry (For 4 servings)

225 g. liver	5 g. red chillies
5 g. aniseed (*sombu*)	5 g. ginger
2 g. turmeric	3 g. cardamom
30 g. onions	5 g. garlic
2 g. fenugreek seeds powder	15 g. vinegar
A coconut	30 g. fat
20 g. salt	A few curry leaves
400 g. water	

METHOD:

1. Wash and boil the liver with water and salt. Cut into cubes.
2. Roast and grind red chillies.
3. Grind aniseed.
4. Peel and slice ginger, garlic and onions.
5. Grate and extract thick coconut milk.
6. Put the liver into a pan with coconut milk and all the ingredients except fat.
7. Boil till *masala* and onions are cooked.
8. Remove gravy. Add fat and fry the liver.
9. Pour back the gravy and cook for about 5 minutes.

Kheema (For 4 servings)

500 g. minced meat	55 g. *ghee*
100 g. peas	50 g. tomatoes

60 g. onion	6 g. green chillies
·3 g. cinnamon	3 g. cloves
2 g. black cardamom	2 g. bay leaf
10 g. chilli powder	5 eggs

METHOD:

1. Chop onion and tomatoes and fry in hot fat.
2. Add all the ingredients except eggs and peas.
3. Cook on a slow fire for 30 minutes or till the minced meat is tender.
4. Add a little water if necessary.
5. When three-fourths done, add peas.
6. Serve with hard boiled eggs cut into halves.

N.B. Remove whole spices if desired.

Mutton soup (For 4 servings)

900 g. mutton	120 g. onion (large)
60 g. coconut (desiccated)	560 g. milk
50 g. *ghee*	15 g. turmeric
5 g. cloves	10 g. black pepper
20 g. coriander	5 g. cumin
5 g. cinnamon	50 g. tomato
Salt to taste	

METHOD:

1. Slice onions; cut the mutton into pieces.
2. Baste and cover with water and bring to boil.
3. Simmer till cooked.
4. Strain, keep the stock and separate the meat from the bones.
5. Discard the bones and keep the meat.
6. Put in the milk, the coconut and 280 g. of water.

7. Bring to the boil and simmer till the liquid is reduced to half; strain.
8. Fry the onions in a large pan till they are golden-brown in colour.
9. Add all the spices and the tomato purèe.
10. Cook gently till well blended for 10 minutes.
11. Add stock and the pieces of meat and bring to the boil once.
12. Season with salt.
13. Add coconut milk just before serving.
14. Heat but do not boil after adding the coconut milk.
15. Serve with boiled rice and lemon slices.

N.B. Vegetable soup is made exactly in the same way as when meat stock is used.

6. FISH PREPARATIONS

Fish Pudding (For 4 servings)

450 g. boiled fish (without bones)	450 g. potatoes
30 g. butter	5 g. top of milk

METHOD:

1. Boil and mash potatoes. Add top of milk and butter. Beat well.
2. Flake fish. Add seasoning and cook with flour.
3. Grease well a pie dish.
4. Line the casserole with a thread of the potato.
5. Add a layer of fish and a third of the soup.
6. Continue with a layer of potato, then fish.
7. Mix the remainder of the tomato soup with the

remaining potatoes. When evenly coloured spread over the fish.
8. Rough with a fork bringing it up to a point in the centre.
9. Bake until hot through and nicely browned.

Fish Cakes (For 4 servings)

500 g. salmon	450 g. potatoes
1 egg	30 g. bread crumbs
30 g. fat to fry (absorption)	5 g. chopped parsley
10 g. salt	1000 g. water
A pinch of pepper	

METHOD:
1. Clean, cut and boil fish.
2. Flake and skin fish and remove bones.
3. Boil and mash potatoes.
4. Mix fish, potatoes and seasoning.
5. Divide into equal portions, shape and coat with eggs and toss in bread crumbs.
6. Re-shape and fry in hot fat. Drain and serve hot, garnished with parsley.

Fried Fillets of Fish (For 4 servings)

500 g. pomfret	55 g. bread crumbs
55 g. fat to fry (absorption)	10 g. salt
1 lime	A pinch of pepper

METHOD:
1. Clean and wash fish thoroughly.
2. Fillet each fish into 4 even fillets; skin.
3. Season with pepper and salt.

4. Dip in beaten eggs.
5. Coat with bread crumbs.
6. Deep fry till golden brown.
7. Garnish with lime slices.

7. EGG PREPARATIONS

Scrambled Egg (For 4 servings)

8 eggs
60 g. butter
30 g. milk
A pinch of salt
A pinch of pepper

METHOD:

1. Break the eggs into a bowl.
2. Add pepper and salt and beat lightly.
3. Add milk.
4. Melt half the butter in a thick-bottomed pan.
5. Add the eggs and cook over a gentle heat till eggs are lightly cooked, stirring lightly as eggs set.
6. Remove from heat.
7. Check for seasoning and mix in remaining butter. (Tomatoes and ham can be used in this preparation.)

Omelette (For 4 servings)

2 eggs
15 g. fat
A pinch of salt
A pinch of pepper

METHOD:

1. Break the eggs into a bowl.
2. Season with pepper and salt.
3. Beat well with a fork until yolks and whites are

thoroughly combined and no streaks of white can be seen.

4. Heat the omelette pan. Wipe thoroughly with a clean cloth.
5. Add the fat.
6. When the fat melts add egg mixture, moving the mixture continuously with a fork until lightly set.
7. Remove from the heat.
8. Half fold the mixture over at right angles to the handles.
9. Gently lift out and serve in the centre of a flat dish.
10. Neaten shape if necessary and serve immediately.

(Tomatoes and cheese can be used in the preparation.)

Stuffed Eggs (For 4 servings.)

4 eggs
50 g. margarine
20 g. tomato ketchup

METHOD:

1. Hard boil the eggs.
2. Cool and shell.
3. Cut into halves and remove the yolk.
4. Cream the margarine.
5. Add the yolk and sauce and beat until smooth.
6. Pipe the fillings into the egg whites.
7. Serve with salad.

8. MILK AND MILK PRODUCTS

Panir (For 4 servings)

1000 g. milk
120 g. lemon juice

METHOD:

1. Boil the milk and add lemon juice.
2. Stir and when the milk curdles take off the fire.
3. Strain into a piece of muslin but keep the whey.
4. Hang the cheese till all the water has dripped.
5. Do not squeeze but allow to drip overnight.
6. Put the cheese under a weight so that it becomes flat and all moisture is removed.

Mour Kalambu (For 4 servings)

200 g. pumpkin	200 g. curd
20 g. green chillies	25 g. onion
2 g. turmeric powder	5 g. chilli powder
50 g. coconut	25 g. raw rice
10 g. ginger	20 g. red gram *dhal*
10 g. mustard	5 g. cumin seeds
25 g. gingili oil	500 g. water
A pinch of salt	A few asafoetida
A few curry leaves	A few coriander leaves

METHOD:

1. Clean and soak the rice and *dhal*.
2. Wash and remove the skin of the pumpkin and cut into long cubes.
3. Slice the onions, curry leaves and coriander leaves.
4. Cook the pumpkin cubes in water and also add half the amount of onion, green chillies, chilli powder, turmeric powder and salt.
5. Clean the ginger, slice one half and mash the rest.
6. Meanwhile grind coconut, *dhal*, rice and the ginger into a smooth paste and mix with water. Mix the paste.

7. Add a pinch of salt to the coriander leaves and keep aside.
8. When the pumpkin is soft and cooked, remove from fire.
9. Pour the curd paste and mix well.
10. Season with mustard, cumin seeds, asafoetida, onion and curry leaves.
11. Add this to the sauce.
12. Place the sauce on a very low fire and allow it to simmer for 10 minutes. Remove from fire.

Potato Raita (For 4 servings)

220 g. potatoes	420 g. curd
5 g. green chillies	5 g. chilli powder
5 g. *garam masala*	500 g. water

METHOD:

1. Boil and dice the potatoes.
2. Beat the curd till smooth.
3. Chop the green chillies.
4. Add the potatoes and chillies to the curd and mix.
5. Add salt to taste.
6. Put in a dish, sprinkle with chilli powder and *garam masala*.

   Carrot, cucumber, papaya (raw), mango (raw) can be used instead of potato.

9. BAKED PREPARATIONS

Baked Fish Soufflé (For 4 servings)

500 g. fish	30 g. butter

30 g. flour
2 eggs
A pinch of salt
300 g. milk
A pinch of pepper

METHOD:

1. Melt butter in a pan, Add flour evenly and cook.
2. Add warm milk gradually to form a smooth consistency.
3. Cook to form a medium consistency sauce. Remove from fire and cool.
4. Clean and boil fish.
5. Flake fish and remove skin and bones.
6. Rub fish through a wire sieve, and add seasoning. Add the sauce.
7. Beat yolks and add to fish and sauce stirring all the time.
8. Whisk white of egg to a stiff froth and fold in lightly.
9. Pour into greased dishes and bake until brown; serve immediately with shrimp sauce.

Prawn and Noodle Casserole

500 g. prawn
300 g. milk
55 g. butter
55 g. onion
55 g. cheese
A pinch of pepper
115 g. noodle
30 g. flour
55 g. capsicum (giant chillies)
A pinch of salt

METHOD:

1. Shell and wash prawns. Remove intestines. Wash again. Boil, cool and drain.
2. Cook noodles in boiling salted water. Boil 10 to 15 minutes or until tender and drain.

3. Make a white sauce with flour, butter and milk.
4. Cook chopped giant chillies and onion in salted water till tender. Drain and add to white sauce.
5. Arrange noodles and prawns in layers in a well-greased dish.
6. Cover in white sauce and sprinkle with grated cheese.
7. Bake in moderate oven 375° F for about 10-15 minutes.

Duchess Potatoes (For 4 servings)

225 g. potatoes	1 egg
30 g. hot milk	15 g. butter
10 g. salt	500 g. water
A pinch of white pepper	

METHOD:

1. Peel and boil potatoes till tender.
2. Strain and mash or sieve.
3. Stir on the fat into the hot sieved potatoes.
4. Mix well; add beaten eggs and milk.
5. Add seasoning.
6. Fill forcing bag and squeeze mixture out on to a greased baking sheet in the shape of a rose.
7. Brush with beaten egg or melted butter.
8. Bake in a quick oven till brown at 400° F for 10 minutes.

Egg nests (For 4 servings)

4 eggs	800 g. potatoes
20 g. margarine	50 g. milk
A pinch of salt and pepper	

METHOD:

1. Prepare, and cook and mash the potato.
2. Melt the margarine and beat half of it and the milk into the potato.
3. Place the potato in 3" deep baking tins. Smooth over the top.
4. Use a shell egg to make a nest, and break an egg into each.
5. Sprinkle the rest of the margarine over the top and place in hot oven until the eggs are cooked and brown.
6. Serve hot.

10. SNACKS

Bhel Poori (For 4 servings)

225 g. gram flour	20 g. salt
2 g. asafoetida	6 g. chilli powder
3 g. baking soda	200 g. oil for frying
100 g. water	

METHOD:

1. Sift flour with baking soda.
2. Add chilli powder, salt and asafoetida dissolved in 10 g. of water.
3. Add enough water to make a stiff dough.
4. Press into hot oil through *sev* press.
5. Lightly stir as it hardens to prevent lumps. Fry till crisp. Remove from fire.

Poories (For 4 servings)

55 g. *sooji*	55 g. *maida*
55 g. *atta*	25 g. water
50 g. oil for frying	2 g. salt

METHOD:

1. Mix *sooji, atta, maida* and salt.
2. Add enough water to make a stiff dough.
3. Stand for half an hour. Knead well.
4. Divide into even portions the size of a walnut.
5. Roll out into thin rounds.
6. Fry in hot oil till brown and crisp.
7. Remove and drain.
8. Allow to cool.

Hot Chutney

50 g. coriander leaves	4 g. green chillies
5 g. ginger	4 g. garlic
10 g. roasted gram	5 g. salt
25 g. water	

METHOD:

1. Wash and chop coriander leaves, green chillies, ginger and garlic.
2. Grind to a smooth paste with roasted gram and salt.
3. Mix with a little water if paste is too thick.

Sweet Chutney

100 g. dates	30 g. tamarind
8 g. sugar	2 g. salt

METHOD:

1. Remove the seeds from dates.
2. Soak tamarind in a little water for 15 minutes. Extract pulp.
3. Grind together dates and tamarind.
4. Add sugar and salt.

Bhel:

Mix together 1 kg. of puffed rice, *sev puris* broken into pieces and the two chutneys. Add sliced boiled potatoes, chopped onion and coriander leaves. Add lime juice to taste.

N.B. Mixing can be done separately, and as and when required.

Pani Puri (For 4 servings)

225 g. *maida* flour
115 g. *rawa* (semolina)
50 g. cold water
115 g. *urud dhal* flour (black gram *dhal* flour)

Milling:

55 g. germinated gram

Pani:

55 g. mint leaves
15 g. salt
15 g. sweet cumin
115 g. dry mango powder
1000 g. water
15 g. black pepper
12 g. cumin
4 g. cloves
10 g. ginger

METHOD:

1. Sieve the flours together.
2. Make a stiff dough, knead well.

3. Make small balls.
4. Roll into fairly thick *poories.*
5. Spread on a moist cloth and cover with another moist cloth.
6. Fry in deep fat till light brown and crisp.
7. Boil in salted water the germinated gram.

Pani:

1. Wash mint leaves, grind cumin seeds, sweet cumin, cloves and ginger.
2. Soak dry mango powder for ½ hour and sieve the pulp.
3. Powder salt and dissolve in cold water.
4. Mix the ground spices with pulp and salt water.
5. Strain and keep in an earthen pot.

Service:

Make a hole in the *poorie* and put in a few grains of sprouted gram. Dip the *poorie* in the prepared liquid. Fill with *pani* and serve.

Peda (For 4 servings)

225 g. dried fresh whole milk	115 g. sugar
5 g. cardamom	10 g. pistachios

A few silver papers.

METHOD:

1. Mix dried fresh whole milk with sugar.
2. Put into a pan and cook on a very slow fire stirring all the time.
3. Add crushed cardamom.
4. When mixture is ready (mixture forms balls when tested with fingers) pour into trays and leave to set.

5. Break up when set.
6. Form into desired shapes and decorate with pistachios and silver paper.

Chocolate Barfi (For 4 servings)

2700 g. dried fresh whole milk
1000 g. sugar
225 g. cocoa

METHOD:

1. Mix sugar with dried whole milk.
2. Put into a pan and stir.
3. When mixture is ready (mixture forms balls when tested with fingers) put half into a greased tray and allow to set.
4. Blend cocoa with the other half and heat till it becomes creamy.
5. Spread over the first layer and allow to cool.
6. Cut into shapes and use.

Jalebi (For 4 servings)

115 g. *maida* flour
15 g. oil
80 g. water
15 g. Bengal gram *dhal* flour
15 g. curd

METHOD:

1. Mix together *maida*, Bengal gram *dhal* flour, oil and curd.
2. Add warm water to make a thick batter.
3. Leave to ferment for about 16 hours.
4. Add colouring.
5. Fry in oil by pouring through a coconut shell

with one hole or through a cloth bag with a hole to form a circular pattern.
6. Fry till crisp.
7. Put into prepared syrup (syrup must be just cooled).
8. Leave for about 3-5 minutes.
9. Remove and arrange in plates.

Sugar Syrup:

115 g. sugar	120 g. water
10 g. fresh milk	

METHOD:
1. Prepare a sugar syrup with sugar and water.
2. Clarify using milk. Strain through a muslin.
3. Re-heat to get one string consistency, cool and use.

N.B. Jalebi can be used garnished with sliced pistachio nuts.

Thali Sweet (For 4 servings)

115 g. *sooji*	115 g. butter
225 g. sugar	5 white of eggs
30 g. almonds	50 g. rose water

METHOD:
1. Blanch and mince almonds.
2. Cream butter and sugar till fluffy and light.
3. Add *sooji*, mix well. Add minced almonds.
4. Beat egg whites stiff and fold in gradually.
5. Add rose water, mix well and leave aside for ½ hour.
6. Put the mixture in a greased tin.
7. Decorate the top with thin strips of kneaded flour.
8. Bake in a moderate oven.

Rasgullas (For 4 servings)

1000 g. milk	680 g. sugar
530 g. water	15 g. flour
6 g. lime juice	5 g. cardamom

METHOD:

1. Boil the milk and add lime juice.
2. Remove from fire.
3. Strain and hang in a muslin bag for ½ hour.
4. Add flour to cheese and knead to a light mixture.
5. Prepare sugar syrup of one strong consistency (clean using a tablespoon of milk).
6. Crush cardamom.
7. Divide cheese into 15 portions.
8. Keep a piece of cardamom in the centre and make even-sized smooth balls.
9. Cook in syrup for 10 minutes.
10. Add 30 g. of cold water.
11. Cook again for 5 minutes; when cooked add 120 g. of cold water and remove from fire.

Crullers (For 4 servings)

115 g. sugar	55 g. butter
340 g. *maida* flour	3 eggs
5. cinnamon powder	10 g. milk
3. g. mace (*myristica fragrans*)	6 g. baking powder
200 g. fat (for frying)	

METHOD:

1. Clean together sugar and butter.
2. Add beaten eggs and beat mixture well,

3. Add cinnamon and mace powder.
4. Add 225 g. of *maida* and milk. Mix well.
5. Sift together remaining flour and baking powder.
6. Add to the mixture to form a dough.
7. Roll out $\frac{1}{4}''$ thick, cut doughnuts.
8. Fry in deep fat till golden brown in colour.

Kangen (For 4 servings)

75 g. sugar
2 eggs
250 g. flour
3 g. salt
100 g. fat (for frying)
30 g. vegetable fat
150 g. milk
10 g. baking powder
10 g. almonds or any nuts

METHOD:

1. Cream sugar and fat till light and fluffy.
2. Add beaten eggs and milk. Mix well.
3. Sift together flour, baking powder and salt.
4. Add creamed mixture and finely chopped nuts.
5. Roll out lightly. Cut out with a doughnut cutter.
6. Fry in hot fat (deep frying) till light brown.

Mohanthal (For 4 servings)

115 g. gram flour (basen)
60 g. milk
6 g. cardamom
340 g. sugar
30 g. pistachios and almonds
170 g. fat

METHOD:

1. Mix gram flour, milk and 85 g. of fat.
2. Make a thick syrup of the sugar.
3. Blanch and slice almonds and pistachios.