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- Diseases and their classification
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- Food-borne illness: food poisonings, food infections
- Bacterial food poisonings or intoxications
- Bacterial food infections
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- Viral infections
- Parasitic infestations
- Food allergies
- Control of food-borne illnesses

## Food-Borne Diseases

### INTRODUCTION

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A food-borne illness is a general term applied to all types of illnesses caused by an organism, substance or material of any kind which is present in food and gains entrance into the body when such food is consumed.

The cause of contamination is generally faulty handling, poor sanitary practices, insects, rodents or microorganisms. The natural decay that occurs in animal or plant tissues is accompanied by foul odours, and changes in appearance and taste. As the spoilage is visible, people reject the food. The main cause

for concern is food which is spoilt but where spoilage is not visibly noticeable. Such food is likely to be consumed and may result in disease.

Food may transmit disease by any of the following ways:

1. The food itself may be wholesome but may act as a vehicle of disease transmission. Pathogenic organisms can be transmitted from one person to another through many routes like soiled linen, unclean cups, handkerchiefs, door handles, etc. Food handled with soiled



hands or on which an ill person or a carrier has coughed or sneezed, can also cause illness. Diseases like tuberculosis, tonsillitis, typhoid and influenza can be easily transmitted this way.

2. The food may serve as an ideal medium for rapid growth and multiplication of a large number of microorganisms like Staphylococci and Salmonella. This may result in food poisoning or food infection. These microorganisms can cause violent illness of the stomach and intestinal tract. Some of these bacteria release toxins into the food. The bacteria may die but the toxins formed cause food poisoning.

Other bacteria do not act until they are consumed along with food. They then cause an infection of the gastro-intestinal tract.

3. Food poisoning may be caused by agents other than microorganisms. These include toxic chemicals, poisonous plants like poisonous mushrooms, insecticides and pesticides. Toxic metals such as cadmium, zinc, lead, etc., or excessive use of mono-sodium-glutamate in Chinese food may lead to severe reactions. Some individuals may show abnormal sensitivity to certain foods and develop allergies. Common food allergens are egg white, shellfish and strawberries.

*Food-borne hazards* may thus result from microbial action, toxic metals and pesticides, animal parasites, natural poisons in foods or allergic reactions of a person due to sensitivity to a particular food.

Of all the food-borne hazards listed above, diseases caused by microbial action in food is most widespread. Microorganisms cause food poisoning and food infection and animal parasites cause infestation. All these can be controlled by hygienic handling of food and good personal hygiene. The food service manager has a crucial role to play in reducing the risk of food spoilage and the spread of food-borne disease. In *Chapter 2* we have read about food spoilage and its prevention. This chapter deals with the pathogens in the kitchen and environment that need to be controlled and eradicated. Carelessness on part of the food handler can result in anything ranging from severe discomfort to chances of dying from the illness. It can cost the outlet lakhs of rupees in terms of closure for disinfection of premises, wastage of food, disposal of equipment and damage to the reputation through closure, court cases and negative publicity. Before we study about the various food-borne diseases and their mode of transmission, it is necessary to understand some basic concepts about disease.

## DISEASES AND THEIR CLASSIFICATION

A disease is a negative state of health. It is defined as a deviation from normal health which adversely influences the daily routine of a person. The term 'disease' is associated with absenteeism from work, reduced work efficiency and loss of production. All this has a marked influence on any service-oriented industry like the catering industry.

Diseases are broadly classified into two categories: communicable diseases and non-communicable diseases. Communicable diseases include infectious or contagious diseases and parasite infestations. Non-communicable diseases include deficiency diseases, organic diseases and allergic diseases.

### ■ Communicable Diseases

**Infectious Diseases** These are caused by microorganisms and are transmitted by direct or indirect contact. Infectious diseases include illnesses like typhoid, hepatitis and influenza. Some infectious



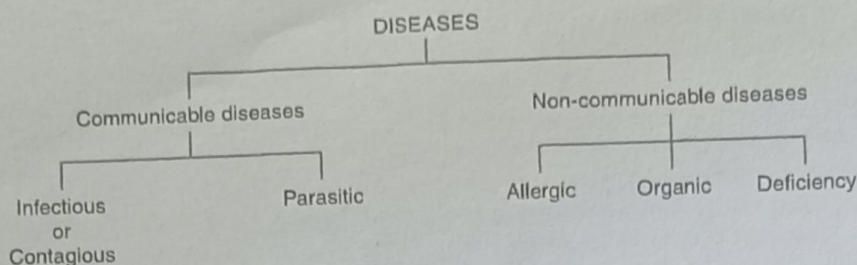


Fig. 4.1 Classification of diseases

diseases are highly contagious and are transferred by direct contact with the patient. People suffering from contagious diseases like chicken pox need to be isolated.

**Parasitic Diseases** These are diseases which are caused by the presence of animal parasites like tapeworms, roundworms and pinworms, which grow in the human gut. They come from improperly washed vegetables which are contaminated with untreated sewage used as manure and which are consumed raw.

#### ■ Non-communicable Diseases

**Deficiency Diseases** These occur because of a shortage of certain nutrients or foods in our daily diet. Night blindness results from a deficiency of Vitamin A and anaemia from iron deficiency. Protein calorie malnutrition results from a shortage of food.

**Organic Diseases** These diseases are caused by malfunctioning of certain organs in our body for example, pancreatic malfunction causes diabetes.

**Allergic Diseases** These disorders occur because of the abnormal sensitivity of the body to certain foods which are normally consumed in the diet. These reactions are restricted to some people only and may be caused by egg white, shellfish, strawberries and many other foods.

### MODE OF TRANSMISSION OF DISEASE

Diseases may be transmitted by more than one route. The common routes of transmission are:

1. **Contact transmission:** by direct or indirect contact with the source of disease
2. **Vehicle transmission:** where milk, water and other foods act as vehicles for transmitting disease
3. **Vector transmission:** by insects and other invertebrate hosts that transmit infection by inoculation into the skin, by biting or by depositing infective material on skin, food and other objects by their feet and bodies or by regurgitating on food
4. **Air-borne transmission:** by droplet infection, droplet nuclei and infected dust. Droplet infection can occur when a person sneezes or coughs and expels particles of moisture containing a large number of organisms, up to a radius of 1 metre or more. When the moisture from smaller droplets evaporates, a minute particle of virus or bacteria which are called droplet nuclei, remain suspended in the air.

*Infected dust:* larger droplets of moisture settle down on the floor and become a part of dust. During dusting or sweeping these dust particles become air-borne and get inhaled or settle on uncovered food and drink.

Disease is transmitted through food either directly or indirectly. In direct transmission of disease, the following pathway is involved (Fig. 4.2).

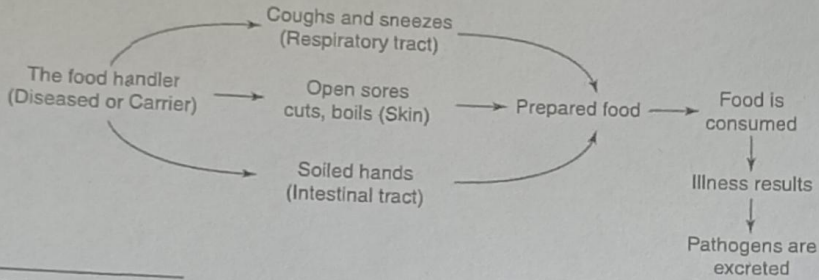


Fig. 4.2 Direct transmission of disease

### ■ Direct Transmission

The food handler transmits pathogens to food. Because of coughing or sneezing on or near the food, droplets containing microorganisms may fall on the food.

Diseases of the intestinal tract are transferred by unwashed or improperly washed hands. If food is handled by hands soiled with faecal matter, disease-causing agents are transferred to the prepared food. Consumption of such food causes illness. When food is openly displayed, it can get contaminated by the customer handling the food.

### ■ Indirect Transmission

The host of a communicable disease may transmit pathogens indirectly through various routes onto prepared food and from there to other people consuming the offending food (Fig. 4.3). The other indirect routes of transmission of disease causing agents or pathogens are through:

1. contaminated utensils and equipment
2. sewage polluted water and food grown on polluted soil or through faulty plumbing
3. soiled linen, door handles and taps
4. insects like flies and cockroaches
5. rodents like rats and mice
6. infected animals and their products

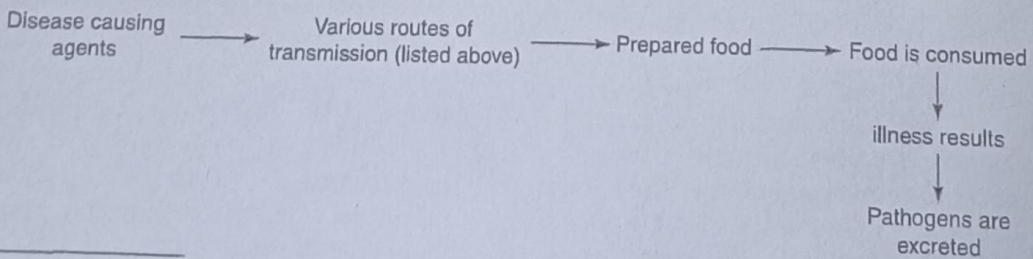


Fig. 4.3 Indirect transmission of disease



Food may be contaminated through unclean utensils and equipment. The pathogenic organisms eliminated from the human body are found in sewage. Sewage is mainly faecal matter. If untreated sewage is allowed to drain into any drinking water, the water as well as fish breeding in such waters get contaminated. Salad vegetables, roots and tubers are at a greater risk of contamination as they are consumed raw and because they are in direct contact with the soil. Rats, mice, flies and cockroaches can also transmit disease. They live in sewers and garbage dumps. Unpasteurised milk and meat from diseased animals can transfer pathogens of animal origin.

The spread of communicable diseases can be controlled and these diseases are discussed in detail later on in this chapter.

### ■ Cross-contamination

Harmful microorganisms present in one food can contaminate another food. This process is known as cross-contamination and is defined as the transfer of microorganisms from something dirty to something clean, or from a food with many bacteria to a food with less bacteria, by means of a non-food vehicle such as

1. chopping boards, knives, utensils and equipment
2. work surfaces, dish cloth, etc.
3. hands of the food handler
4. drops of liquid oozing from contaminated food
5. infected droplets from coughs and sneezes

Cross-contamination can occur whenever clean and dirty operations are mixed or if the same equipment is used for handling raw and cooked meat without cleaning and sanitising it between use. Raw meats and its juices contain many bacteria which are transferred to cooked meat by using the same equipment. Cross-contamination of cooked meat can be prevented by:

1. storing raw and cooked meat separately and not next to or on top of each other, to prevent drops of liquid oozing
2. colour coding equipment such as chopping boards and knives for handling only one type of food, for example using the colour pink for raw meat and poultry and brown for cooked meat and poultry
3. preparing cooked and raw meats on separate tables

Other examples of cross-contamination are:

1. When a dishwasher places clean and sanitised plates on a table reserved for dirty plates, the plates get contaminated.
2. When a busboy brings used plates to the dishwashing machine and picks up clean plates without washing his hands, the clean plates get contaminated.

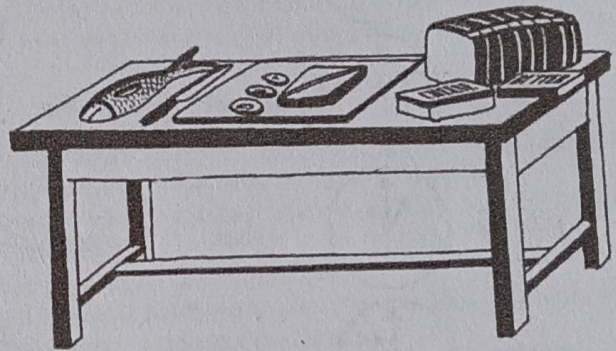


Fig. 4.4 Cross-contamination can cause food poisoning



3. When the chef places a dirty cardboard box on a food preparation table, the table gets contaminated and any food kept on that table will also get contaminated.

Even when a potentially hazardous food gets contaminated, it does not become harmful immediately. The bacteria transferred to the food need time and a warm temperature to multiply before the food can cause a food borne illness when consumed.

## FOOD-BORNE ILLNESS

Microorganisms which cause food-borne illnesses are bacteria, viruses, protozoans and nematodes. Among all these microorganisms, bacterial contamination is the most common cause of food poisoning in the catering industry. It usually results from mishandling of food. These illnesses are characterised by a severe disturbance of the stomach and intestines which occurs after consuming food in which the offending bacteria were given a chance to multiply. Such illnesses are broadly divided into two categories: food poisonings and food infections.

### ■ Food Poisoning

Food poisoning or food intoxication is an illness caused by toxins present in contaminated food. The toxin may be a poisonous chemical toxin which is accidentally or intentionally added, a naturally occurring poison like solanine in green potatoes or a toxic metabolite excreted by bacteria.

In bacterial food poisoning, the toxin is produced during multiplication of cells. When food is consumed, the toxin already present irritates the lining of the stomach and causes vomiting. If the toxin reaches the intestine, it may cause abdominal pain and diarrhoea. The incubation period for such food poisonings is comparatively shorter (one to six hours) than that for bacterial food infections. The offensive food may not contain any living bacteria, which may have been destroyed during heating.

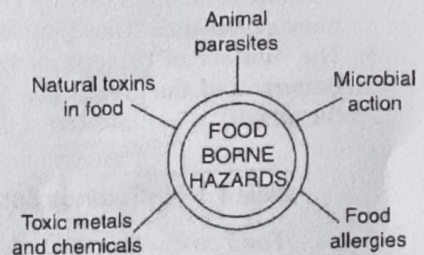


Fig. 4.5 Food-borne hazards result in food-borne illnesses

### SOME IMPORTANT FACTS

- Food poisoning causes more than 23 million lost working days in a year
- The number of reported cases has doubled in the last ten years
- In spite of more public awareness about hygiene, food poisoning is on the increase
- The standards of food hygiene in most establishments is very poor

Toxins need much higher temperatures to be destroyed than the bacteria which produce them. They may thus be present in inadequately heated foods, even if the bacteria have been destroyed. However, some food poisonings occur only when large numbers of live bacteria are ingested. When these bacteria reach the intestinal tract they produce the toxin, for example, *Clostridium perfringens*.