

Food Contamination

What is Contamination?

Contamination is the state of being impure or unfit for use due to the introduction of unwholesome or undesirable elements.

Contamination of food

People's lives depend on a reliable and safe food supply that is free from harmful substances.

- Contamination occurs when something not normally found in the food is added.**
- Contamination implies the addition is not intended or planned. The substance added may or may not cause health problems.**

Contamination of food

The three main ways in which food can be contaminated are:

- 1) Microbial contamination (includes bacteria, moulds and viruses)
- 2) Physical contamination
- 3) Chemical contamination

Microbial contamination:

Mold often occurs if food is stored at the wrong temperature, at high humidity or beyond its recommended shelf-life.

Viruses may be brought into food on raw foods such as shellfish which have been bought from an unapproved source.

Bacterial contamination is the most significant in terms of microbial food poisoning and foodborne illnesses.

Bacterial Contamination of food

Bacterial cross-contamination may be defined as: “the transfer of harmful / pathogenic bacteria from one item / food / surface / person to food.”

Direct cross-contamination: occurs in food when there is direct contact between the source of the bacteria and food.

Examples include:

- Raw meat stored above or in contact with cooked meat
- Raw chicken stored above or in contact with coleslaw
- Food handler sneezing/coughing onto food

Bacterial Contamination of food

Indirect cross-contamination: This occurs when harmful bacteria are transferred from the source to the food via a vehicle.

Examples include:

- Using the same knife/chopping board to slice raw meat and then cooked meat without washing it and disinfecting it between tasks
- Using the same cloth to wash down the raw food preparation area and then the cooked food preparation area
- Touching food after blowing your nose, without first washing your hands

Types of Foodborne Illnesses

Most cases of foodborne illness are a result of pathogens in food.

The pathogens that cause foodborne illness do not necessarily cause undesirable changes in food.

Many times, pathogens cause a food to be unsafe to eat before there are any visible signs of spoilage. Pathogens can cause illness in one of two ways:

- 1) Food Intoxication**
- 2) Foodborne infections**

Toxicoinfections (Food Intoxication)

- Some microbes can give off a by-product that causes illness.
- Substances released by microbes that are harmful to humans are called ***toxins***. In this case, it is not the microbe that makes people sick but the toxin it produces.
- Killing the microbes may not be enough to prevent cases of food intoxication. If the toxin is still present and has not been damaged or altered, the person will still become ill.
- The severity of the illness will depend on the amount of toxins present in the food eaten and on how susceptible the person is to illness.

Toxicoinfectious Bacteria (Food Intoxication)

- Staphylococcus Aureus**
- VIBRIO CHOLERAE**
- BACILLUS CEREUS (DIARRHEAL-TYPE)**
- Clostridium BOTULINUM (IN INFANTS)**
- Clostridium PERFRINGENS**
- ENTEROTOXIGENIC E. COLI (traveler's diarrhea)**

Food Intoxication

GROWS/MULTIPLIES IN FOOD

IMPACTED BY FOOD ENVIRONMENT

TEMPERATURE ABUSE

PRODUCES TOXIN IN FOOD

TOXIN INGESTED BY HOST: RAPID ONSET

HOST RESPONSE

EMETIC (Stomach upset and cramps, Nausia and vomiting)

NO FEVER

foodborne Infections (invasive Infections)

Microbes release digestive enzymes that begin to damage body tissue and cause illness. This type of foodborne illness is called *foodborne infection*.

- This infection cannot occur if the microbes are killed.
- Foodborne infections may be caused by bacteria, viruses or parasites. A large number of living organisms is usually required to cause illness.
- Symptoms caused by damage when organisms feed on their host (Fever, diarrhea, vomiting, abdominal pain).

INVASIVE INFECTIONS (Foodborne Infections)

INVADE BODY TISSUES AND ORGANS.

Invasive Infection Bacteria are:

- ✓ SALMONELLA
- ✓ AEROMONAS
- ✓ CAMPYLOBACTER
- ✓ SHIGELLA
- ✓ VIBRIO PARAHAEMOLYTICUS
- ✓ YERSINIA
- ✓ ENTERIC-TYPE ESCHERICHIA COLI

INVASIVE INFECTIONS

(Foodborne Infections)

Viral Infections:

Three main types of viruses have been found to cause foodborne illness. These include:

Rotavirus

Norwalk virus

Hepatitis A virus.

Infections have been traced to infected food handlers.

INVASIVE INFECTIONS

(Foodborne Infections)

Parasitic infections (Worms and Protozoa)

Parasites are organisms that need a host to survive, living on or within it. parasites can infect people through food or water

1. parasitic worms

Parasitic worms: include roundworms, tapeworms.

These worms vary in size from barely visible to several feet in length.

2. protozoa: Protozoa are single-cell animals, and most cannot be seen without a microscope.

Parasites have the opportunity to infect humans when people eat them along with the food.

Growth Factors for Microorganisms

NUTRIENTS

OXYGEN

MOISTURE (WATER ACTIVITY)

SALT TOLERANCE OR PREFERENCE

ACIDITY TOLERANCE/PREFERENCE

GROWTH TEMPERATURE

Destruction of Microorganisms

1. HEAT TREATMENT

STERILIZATION

PASTEURIZATION

2. AGENTS

SANITIZERS, DISINFECTANTS

ANTIBIOTICS

Destruction of Microorganisms

3. DEHYDRATION

DIRECT EFFECTS

INDIRECT EFFECTS (CONCENTRATE SALTS & SUGARS)

4. Preservative AGENTS

ACIDS, SUGARS

CHEMICAL PRESERVATIVES

Destruction of Microorganisms

5. IRRADIATION

LOW ENERGY

MICROWAVE

ULTRAVIOLET

HIGH ENERGY

GAMMA, X-RAYS

Chemical Contamination of Food

Undesirable chemicals can enter foodstuffs during:

- **Growth** – e.g. veterinary drugs (antibiotics and hormones), fertilizers, pesticides and environmental contaminants e.g. lead
- **Processing** – e.g. oils and lubricants from machines, cleaning chemicals
- **Transport** – e.g. as a result of spillage or leaks
- **Sale** – e.g. cleaning chemicals

Classes of Chemical Residues

1. FOOD ADDITIVES (e.g. vitamins, colors, flavours)
2. PESTICIDE RESIDUES
3. Veterinary medicines (e.g. HORMONES and antibiotics)
4. ENVIRONMENTAL RESIDUES (lead: leaded gasoline, solder for tin canned food)
5. Cleaning agents
6. Allergens

Naturally Occurring Chemical substances

PLANT SOURCES

MUSHROOMS

ANIMAL SOURCES

SEAFOOD TOXINS (74% OF CHEMICAL FOOD POISONING (CDC))

MICROORGANISMS

MYCOTOXINS (molds: e.g. aflatoxin in peanuts and corn)

Chemical Hazards

ACUTE

SMALLER MORE ISOLATED OUTBREAKS
USUALLY ACCIDENTAL/MIS-USE

CHRONIC/LONG TERM

MAJORITY
EXCEPT TOXINS (USUALLY ACUTE)
LONG TERM EXPOSURE
CARCINOGENS/OTHER TOXIC EFFECTS

RISK ASSESSMENT

LESS STRAIGHT FORWARD (compared to biological hazards)

Physical Contamination

- Food can be contaminated physically by foreign objects.
- Foreign objects can be brought into the premises with raw materials or introduced during storage, preparation, service or display.
- Foreign objects which are commonly associated with food complaints include:
 - Nuts, bolts, wire, metal
 - Cardboard, plastic, string
 - Rodent droppings, hairs, insects
 - Cigarette butts, glass, flaking paint
 - Earrings, fingernails

SOURCES OF CONTAMINATION

- ✓ RAW MATERIALS
- ✓ POOR DESIGN AND MAINTENANCE OF FACILITIES
- ✓ EQUIPMENT MAINTENANCE
- ✓ POOR PRACTICES IN OPERATION
- ✓ SABOTAGE

Allergens

Some people are allergic or have an intolerance to certain types of foods and become ill after eating them. These foods include Peanuts, Tree nuts, Eggs, Shellfish, Cow's milk, Wheat (gluten), Soy.

As a food handler, you must be careful not to inadvertently contaminate food that is supposed to be free from allergens. You must also be careful to give the right information about ingredients to customers who ask.