



higher education  
& training

Department:  
Higher Education and Training  
REPUBLIC OF SOUTH AFRICA



Tshwane South  
TVET College

*"achieve the future"*

**SUBJECT: SANITATION AND SAFETY**

**LEVEL: N4**

**MODULE 3: MICROBIOLOGY**

# MICROBIOLOGY

After completing this topic, you will be able to:

- discuss the general characteristics of microorganism
- Discuss microorganisms that cause food spoilage
- Discuss the factors that influences the growth of microorganisms
- Name the general factors that lead to the destruction of microorganisms
- Discuss the role chemicals and poisonous plant and animals play in food poisoning and diseases spread by food
- Discuss the transferring of food poisoning with regard to chain and broken chain
- Discuss food that is easily contaminated

# **MICROBIOLOGY**

## **CONTENT**

1. General characteristics of microorganisms
2. Microorganisms that cause food spoilage
3. Factors that influence the growth of microorganisms
4. Destruction of micro organisms
5. Causes of food poisoning and disease spread by food
6. Medium for food poisoning

## 1. General characteristics of microorganisms

Microorganisms can live in the air, on land and in fresh or saltwater environment. they can be harmful or cause disease but some of them are needed for living thing to survive

Microorganisms can be used for:

- ferment useful chemical (ethanol, acetone)
- produce certain food stuffs (wine, cheese, yoghurt, bread)
- destroy wastes (sewage, oil spills)
- cause and prevent diseases
- produce antibiotics used to treat diseases

Types of microorganisms

- bacteria
- fungi
- protozoa
- microscopic algae
- viruses

## 2. microorganisms that cause food spoilage

1.

Protozoa	Algae	Viruses
These organisms live in water-based surroundings such as ponds, lakes and sea	Is found were sunlight and water are available and it grows in ponds or lake giving it a distinct green colour	Have different mechanism by which they produce disease in an organism, e.g cold sore, influenza



Figure 1- Algae

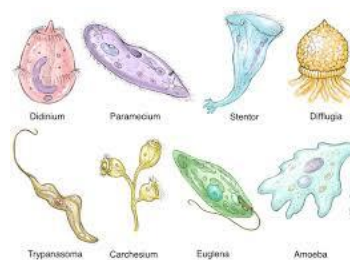


Figure 2- Protozoa

## 2.

Fungi	Yeast	Mould
Group of simple plants that have no chlorophyll and it cannot make its own food	are small single cell organisms and it can be used for in the area of baking and fermenting wine	Grow under conditions in which air and moisture are present.



Figure 1 Fungi  
yeast



Figure 2 Mould



Figure 2

## 3. Bacteria

### Different types of bacteria

- harmless
- beneficial – used in decomposition of dead plant
- undesirable – cause food spoilage
- disease causing – cause food poisoning

## 3. Factors that influence the growth of microorganisms

### Time

Bacteria will grow and multiply by dividing into two every 20 min in moist food at 37 C

### Availability of food

- Microorganisms need a constant supply of food
- High risk food – meat, fish, poultry, milk, stock
- Not high risk food – flour, rice, tomato, olives, syrup

## Moisture

Bacteria require moisture to grow because they obtain most of their nutrients from their aqueous environment

## Temperature

At a temperature of 37 C bacteria multiply most multiply quickly as the temperature continue to rise and they will stop growing altogether above 63 C

## Availability of oxygen

Microorganisms require oxygen for all metabolic process. Those require oxygen are called **aerobes** and those which do not need oxygen are called **anaerobes**

## pH surrounding bacteria

the acidity or alkalinity food will effect bacterial growth

## Competition

Where there are a number of different bacteria present in food, they compete for the same nutrient.

# 4. Destruction of microorganisms

## 1. destructions of microorganisms with regard to heat

- High temperature may be applied as either ,moist heat or dry heat
- Vegetative microorganisms can generally be killed at 50 C to 70 C with moist heat
- **Autoclaving** is commonly employed in canning , bottling and other sterile package procedure

## Chemicals

- Remove pathogens from objects
- An ideal disinfectant or antiseptic kills microorganisms in the shortest possible time without damaging material treated
- Antimicrobial agent – include any form of disinfectant, sanitizer and antibiotics

## Definitions

**Antibiotics** – is a metabolic product produced by one microorganism that kills other microorganisms

**Disinfectant** – any physical process of any chemicals that will kill the growing microbial cell

**Sterilization** – any process that destroys all infectious organisms e.g viruses

### **2. destruction of microorganisms by ionic radiation**

- Ionic radiation for the treatment of packaging food can be achieved using gamma rays, electrons beam or X rays
- It is used to achieve the preservation of food
- Irradiation process can reduce microbial contamination of food

### **3. the destruction of microorganisms by microwave**

Microwaves are high frequency radiation waves, the heat cooks the organic material and destroys the microorganisms present

#### Factors influencing the internal temperature of food

- The initial temperature of food
- The consistency of the food
- Distribution of moisture
- Food density

## **5. causes of food poisoning and disease spread by food**

### Causes of food poisoning

- Bacteria
- Viruses
- Chemical
- Metals
- Poisonous plant/animals

### Symptoms of food poisoning

- Nausea
- Stomach cramps
- Fever
- Vomiting
- Diarrhoea

### Preventing of food poisoning

- Cook food to proper temperature
- Boil water before drinking
- Always refrigerate fish
- Wash your hands

### Microorganisms causing food poisoning

Microorganisms	Prevention
<b>Salmonella</b> is caused by contaminated food or insufficient cooking	<ul style="list-style-type: none"><li>• Making sure you wash your hands</li><li>• Making sure all equipment used is clean</li><li>• Defrosting food in correct manner</li></ul>
<b>Clostridium botulinum</b> Produce a powerful paralytic toxin in food and it can produce illness	<ul style="list-style-type: none"><li>• Destroyed at very high temperature</li><li>• Avoid use of damaged or blown cans</li><li>• Ensure that foods are correctly and thoroughly processed</li></ul>
<b>Staphylococcus aureus</b> It occurs most often in foods that require hand preparation. It causes skin and wound infections	<ul style="list-style-type: none"><li>• Good personal hygiene</li><li>• Refrigeration of raw and cooked food</li></ul>

## **6. Medium for food poisoning**

### The chain

To grow the bacteria, need warmth, moisture, food and time. These elements are known as the food poisoning chain

### Ways to break the chain include

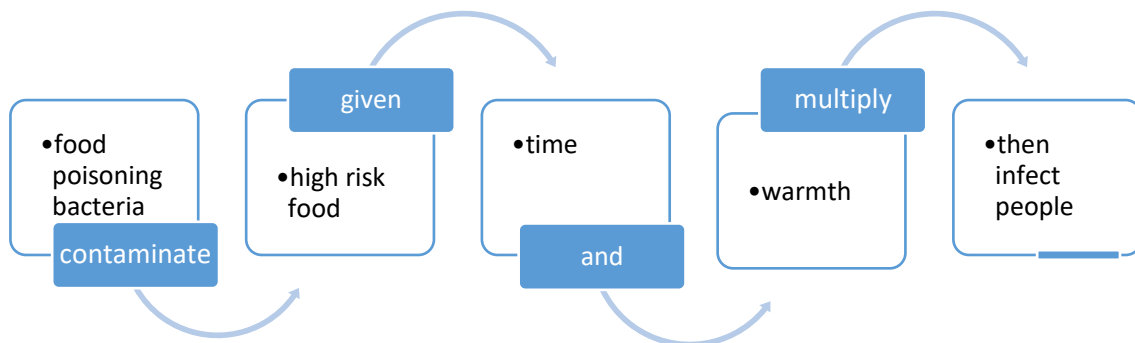
- Inspecting all food and washing fruits and vegetables
- Separating raw and high risk food
- Not using same equipment, utensils and working surface to handle and prepare food
- Keep food covered
- Good personal hygiene practices



## Food poisoning chain

- food poison organisms enter the food service facility
- bacteria is transferred to food at point of preparation or during storage
- the bacteria is supported by the medium
- incorrect storage procedure and temperatures will allow organisms to grow and multiply
- food is consumed
- food poisoning is the result of incorrect food handling

## **FOOD POISONING CHAIN**



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## **1. food that gets contaminated easily with regards to the causes of contamination**

### Meat and poultry

#### Fresh and raw

- meat can be the sources from which others food can be contaminated
- processing of any meat should be done according to hygiene procedures