RQF LEVEL 3

FOPHS303

FOOD PROCESSING

Food Hygiene And Safety

TRAINEE'S MANUAL

October, 2024

FOOD HYGIENE AND SAFETY

KOICA Korea International Cooperation Agency

TQUM TVET Quality Management Project

2024

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TABLE OF CONTENT

ACRONYMS

^{0}C: Degree Celsius

ATP: Adenosine Triphosphate

CBT/A: Competence Based Training/Assessment

CCP: Critical Control Point

CIP: Clean in Place

CO: Carbon Monoxide

CO2: Carbon Dioxide

COP: Clean out of Place

E. coli: Escherichia Coli

E.g: Example

HACCP: Hazard Analysis Critical Control Point

PPE: Personal Protective Equipment

RTB: Rwanda TVET Board

TQUM Project: TVET Quality Management Project

UV: Ultra-Violet

INTRODUCTION

This trainee's manual includes all the knowledge and skills required in food processing specifically for the module of **"Food hygiene and Safety".** Trainees enrolled in this module will engage in practical activities designed to develop and enhance their competencies. The development of this training manual followed the Competency-Based Training and Assessment (CBT/A) approach, offering ample practical opportunities that mirror real-life situations.

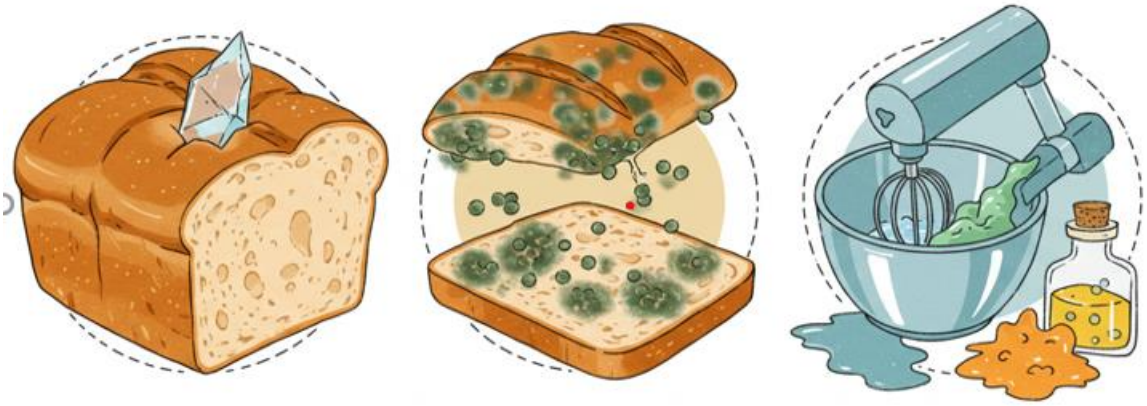
The trainee's manual is organized into Learning Outcomes, which is broken down into indicative content that includes both theoretical and practical activities. It provides detailed information on the key competencies required for each learning outcome, along with the objectives to be achieved.

As a trainee, you will start by addressing questions related to the activities, which are designed to foster critical thinking and guide you towards practical applications in the labor market. The manual also provides essential information, including learning hours, required materials, and key tasks to complete throughout the learning process.

All activities included in this training manual are designed to facilitate both individual and group work. After completing the activities, you will conduct a formative assessment, referred to as the end learning outcome assessment. Ensure that you thoroughly review the key readings and the 'Points to Remember' section.

MODULE CODE AND TITLE: FOPHS303 FOOD HYGIENE AND SAFETY

Learning Outcome 1: Identify food contaminants and hazard.
Learning Outcome 2: Perform hygienic practices.
Learning Outcome 3: Implement food safety.



Indicative contents

1.1 Identification of Physical contaminants and hazards

1.2 Identification of chemical contaminants and hazards

1.3 Categorization of Biological contaminants and hazards

Key Competencies for Learning Outcome 1: Identify food contaminants and hazard

Knowledge	Skills	Attitudes
• Description of physical contaminants and hazards • Description of chemical contaminants and hazards • Description of biological contaminants and hazards	• Differentiating food contaminant and hazard	• Being careful while differentiating food contaminant and hazards

Duration: 10hrs

Learning outcome 1 objectives:

By the end of the learning outcome, the trainees will be able to:

1. Describe correctly physical food contaminants according to their sources.
2. Describe correctly chemical food contaminants according to their sources.
3. Describe effectively biological food contaminants and hazards according to their types.

Resources

Equipment	Tools	Materials
• PPE • Projector	• Sieves • Filters	• Uncontaminated food • Contaminated food

• Computer	• Magnets • Winnowing basket	• Physical contaminants(slivers of glass, human hair, nails, false nails, nail polish(verni), metal fragments dirt, stones, glass) • Biological contaminants (bacteria, molds, viruses, and cat saliva, house dust, mites, cockroaches.) • Chemical contaminants: Cleaning products (e.g. detergent, sanitizer), pesticides/herbicides, toxic chemicals in metals and plastic, preservatives, naturally-occurring toxins Packaging materials that are not food grade, Pesticides)

Indicative content 1.1: Identify physical contaminants and hazards

Duration: 3hrs

Theoretical Activity 1.1.1: Description of physical contaminants and hazards

Tasks:

1: Answer the following questions related to physical contaminants and hazards

i. What do you understand by:
   a. A hazard?
   b. A contaminant?
   c. Food hygiene?
   d. Food safety?
   e. Physical contaminants?
   f. Cross contamination?
   g. Physical hazards?

ii. Give out the examples of physical contaminants you know.

iii. What could be the sources of physical contaminants in food?

iv. What could be the effects of physical contaminants in food?

2: Provide the answers to the asked questions by writing them on papers, flip chart, Blackboard or white board.

3: Present the findings/answers to the whole class.

4: For more clarification, read the key reading 1.1.1

Key readings 1.1.1.: Description of physical contaminants and hazards

- **Differentiation of physical contaminants and hazards**
  - ✓ **Definition of key terms**
    - **A hazard** is a biological, chemical or physical agent in a food with the potential to cause adverse health effects.
    - **A contaminant** a biological or chemical agent, foreign matter, or other substances not intentionally added to food which may compromise food safety or suitability.
    - **Food contamination**: the introduction or occurrence of a contaminant in food or food environment.
    - **Cross contamination**: is the transfer of contaminants from one surface, substance, or food to another especially because of unsanitary handling procedures.
    - **Food hygiene -** all conditions and measures necessary to ensure the

safety and suitability of food at all stages of the food chain.

- **Food safety -** assurance that food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use.
- **Physical contaminants:** is an object that is not designed for consumption and somehow ends up in a food item or meal. These can be man-made items or those of organic origin.
- **Physical hazards** are those physical contaminants that pose a risk when ingested. They are usually resulting from accidental contamination and /or poor food handling practices at some stage of the production.
- **Examples include** broken glass, nails, false nails, nail polish (verni), pieces of jewellery, metal fragments, stones, toothpicks.

- **Source of physical contaminants and hazards**
  - ✓ They can be categorized based on their origin:
    - **Environmental Sources**: These include natural elements like dirt or insects that may come into contact with food during harvesting or processing.
    - **Tools and equipment:** Manufacturing process or production process, machinery may shed parts (like metal shavings, broken glass, plastic debris**)** or packaging materials may break down (like plastic)
    - **Processors/workers** can introduce contaminants such as hair, jewellery, fingernails, buttons, or personal items into food products by improper handling Practices.



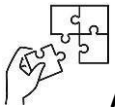
- **Effect of physical contaminants and hazards**

The main effects from physical contaminants and hazards:

- ✓ To cause injuries and illness to consumers.
- ✓ They can also cause serious harm to the consumer, including, broken teeth, cuts and choking.
- ✓ Customer distress.
- ✓ Lost revenue due to having to compensate the customer.

Points to Remember

- Hygiene and safety should consider the prevention of physical contaminants in food because when ingested, they can lead to various injuries, psychological distress among consumers and also to businesses fail due to customer complaints related to physical hazards.
- Environmental, processors/workers and tools/equipment are source of physical contaminants.
- Physical contaminants present in food are unaffected by thermal processing.



Application of learning 1.1.

Visit school workshop; observe physical contaminants found in cereals workshop.

Indicative content 1.2: Identify of Chemical Contaminants and Hazards

Duration: 3hrs

Theoretical Activity 1.2.1 Description of chemical contaminants and hazards

Tasks:

1: Answer the following questions related to the chemical contaminants and hazards:

i. What do you understand by chemical contaminant in food?
ii. Give out the examples of chemical contaminants you know.
iii. What could be the sources of chemical contaminants in food?
iv. What could be the effects of chemical contaminants in food?

2: Provide the answers to asked questions by writing them on papers, flip chart, Blackboard or white board.

3: Present the findings/answers to the whole class.

4: For more clarification, read the key readings 1.2.1

Key readings 1.2.1.: Description of chemical contaminants and hazards

- **Differentiation of chemical contaminants and hazards**
  - ✓ **Definitions**
    - **Chemical contaminants:** are chemical substances that are unintentionally present in food or feed.
      Chemical contamination occurs when food comes in contact with chemicals, which can lead to chemical food poisoning.
    - **Example of Cleaning chemicals**: Cleaning products (e.g. detergent, sanitizer), pesticides/herbicides, toxic chemicals in metals and plastic, preservatives, naturally-occurring toxins

- **Source of chemical contaminants and hazards**

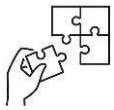
  Chemical contaminants and hazards include:

  - ✓ Agricultural compounds such as pesticides, antibiotics,
  - ✓ Industrial chemicals such as cleaners and sanitizers; and
  - ✓ Equipment-related compounds such as oils, gasoline, and lubricants.
  - ✓ Growth hormones.
  - ✓ Environmental contaminants such as lead and mercury
  - ✓ Chemical preservatives and allergens

- **Effect of chemical contaminants and hazards**
  - ✓ Chemical contaminants and hazards cause allergies to consumers and changes in food properties
  - ✓ Chemical hazards can also result in food chemical poisoning
  - ✓ The contact that individuals have with these substances is linked to numerous health issues:
    - Weakening of the immune system
    - Reduced cognitive function
    - Interference with hormonal balance
    - Increased risk of cancer development
    - Irregularities in reproductive health

Points to Remember

- Food hygiene and safety should consider the prevention of chemical contaminants in food because they are toxic to humans and can cause harm and are associated with foodborne disease outbreaks
- The impact of chemical contaminants on consumer health and well-being is often apparent only after many years of processing. Prolonged exposure at low levels (example cancer)
- Agricultural compounds, industrial chemicals, environmental, chemical preservatives and allergens are sources of chemical contaminants and hazards.
- Chemical contaminants present in food are often unaffected by thermal processing



Application of learning 1.2.

Go to fruits processing plant nearly our school that process fruits into nectar and squash; cross observe chemical contaminants that could happen there.

Indicative content 1.3: Categorization of Biological contaminants and hazards

Duration: 4hrs

Theoretical Activity 1.3.1: Description of Biological contaminants

Tasks:

1: Answer the following questions related to the biological contaminants and hazards

i. What Do you understand by:
   a. Biological hazards?
   b. Food poisoning?
   c. Food spoilage?
   d. Food intoxication?
   e. Food infection?
   f. Macro biological contaminants in food?
   g. Microbiological contaminants in food?
   h. What could be examples in f and g?

ii. What could be the sources of microbiological contaminants for food?

iii. What could be the effects of microbiological contaminants?

2: Provide the answers to asked questions by writing them on papers, flip chart, Blackboard or white board.

3: Present the findings/answers to the whole class.

4: For more clarification, read the key readings 1.3.1

Key readings 1.3.1. Description of Biological contaminants and hazards

- **Differentiation of Biological contaminants**
  - ✓ **Definitions of key terms**
    - **Biological hazards** are organisms, or substances produced by organisms, that pose a threat to human health. They are a major concern in food processing because they cause most food borne illness outbreaks.
    - **Food poisoning:** is a foodborne illness caused by eating food that contains toxins made by microbes or chemical poisons.
    - **Food intoxication:** is food poisoning caused by toxins from microorganisms EX botulism.
    - **Food spoilage** is a metabolic process that causes foods to be undesirable or unacceptable for human consumption**.**
    - **Food infection:** Illnesses that are not caused by bacterial by-products, such as toxins, but through ingestion of infectious microorganisms. Ex Salmonella, clostridium botulinum
  - ✓ **Examples of biological contaminants:** bacteria, molds, viruses, and cat saliva, house dust, mites, cockroaches.

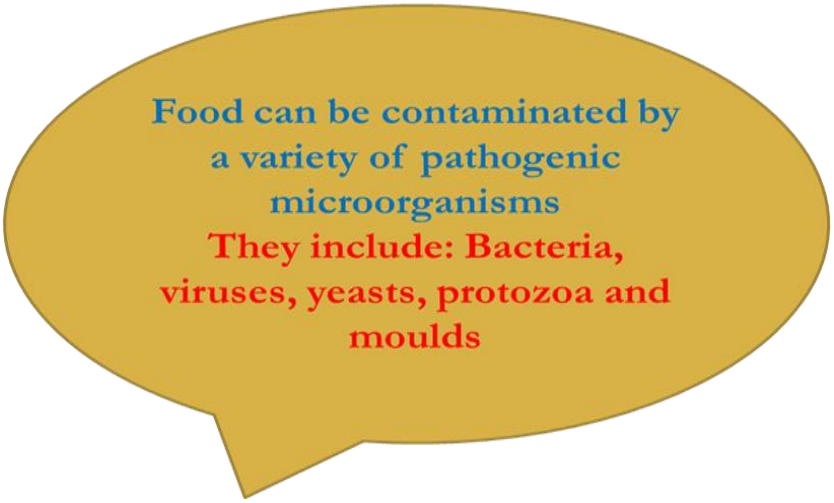
    - **Direct biological contaminants** occur when food becomes contaminated by microorganisms or pathogens that are present in the food itself or introduced directly during handling.
    - **Indirect biological contaminants** refer to substances or agents that do not directly harm organisms but can lead to adverse effects through complex ecological interactions.

      Examples: Indirect food contaminants are insects (cockroaches, houseflies, ants, beetles, and moths), Rodents (rats, mice) and birds.
  - ✓ **Groups of biological contaminants and Hazards**
    - **Macro biological contaminants and hazards** include very small livings things that one can see with the naked eyes.

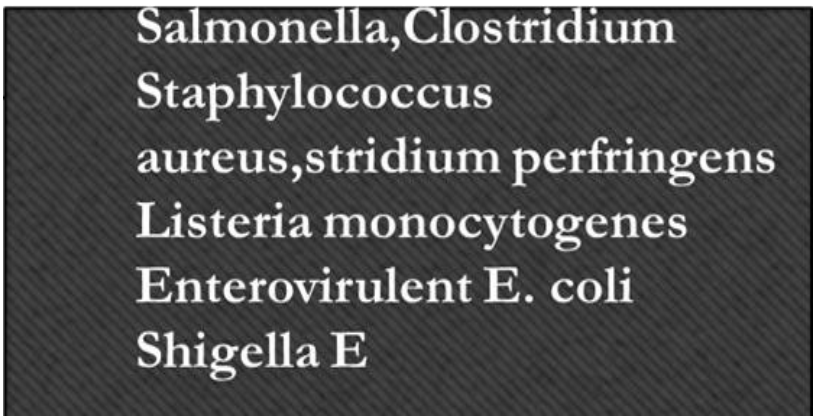
Examples:

- Worms
- Maggots
- Parasites

- **Macro biological contaminants and hazards** such as the presence of flies or insects, maggots, worms and parasites while unpleasant if found, rarely pose a risk themselves to product safety in its true sense. There are a few exceptions to this, such as poisonous insects, but on the whole the appearance of macro-biological hazards simply causes revulsion or nausea.
- **Microbiological contaminants and hazards:** These are tiny substances not always visible to the naked eyes**.** They occur when food becomes contaminated by microorganisms including **bacteria, yeasts, moulds and viruses.**



Bacteria:



Virus:

- Hepatitis
- Norwalk
- Rota
- Polio

Yeasts:

Candida,
Saccharomyces,
Zygosaccharomyces

Protozoa:

- Cyclospora cayetanensis,
- Giardia lamblia, Fasciola,
- Entamoeba,
- Ascaris,
- Anisakis,
- Cryptosporidium,
- Clonorchis

Moulds:

- Alternaria,
- Aspergillus,
- Cladosporiu
- Fusarium,
- Penicillium
- Rhizopus

- **Sources of biological contaminants and hazards**
  - ✓ **Water:** Water is used for cleaning and as an ingredient in many processed foods. However, if the water is not pure, it can contaminate foods.
  - ✓ **Processor:** The most common source of microorganisms in foods is employees. The hands, hair, nose, and mouth carry microorganisms that can be transferred to food during processing, packaging, preparation, and

service by touching, breathing, coughing, or sneezing.

- ✓ **Equipment:** Equipment can be contaminated during production and while it is not being used. Most equipment is designed to be hygienic, but it can still collect microorganisms and other debris from the air, employees, and food ingredients. Food is less likely to be contaminated if equipment is designed to be hygienic and is cleaned regularly and thoroughly.

- ✓ **Waste:** The food industry generates large amounts of waste from used packaging, containers, and waste products. Refuse should be kept in appropriate containers and removed from the food area regularly. The best method (required by some regulatory agencies) is to use separate containers for food waste from those used for litter and rubbish.

- ✓ **Air:** Microorganisms in the air can contaminate foods during processing, packaging, storage, and preparation. The best ways to reduce air contamination are to use filters for air entering food-processing and preparation areas and to package or cover food products to reduce contact with air
- ✓ **Sewage:** Raw, untreated sewage can carry microorganisms, causing typhoid and paratyphoid fevers, dysentery, and infectious hepatitis.
- ✓ **Raw materials**: Ingredients (especially spices) can carry harmful or potentially
  harmful microorganisms and toxins. The amounts and types of these microbes and toxins depend on where and how the ingredient was harvested and how the ingredient was processed and handled.

- **Effect of Biological contaminants and hazards.**
  The main effects from biological contaminants and hazards:
  - ✓ They can spoil food
  - ✓ They can cause food poisoning
  - ✓ They can cause diseases to consumers

Points to Remember

- Food hygiene and safety should consider the prevention of biological contaminants in food, because they can spoil food, they can cause food poisoning and diseases to consumers
- Water, processor, equipment waste, air sewage raw materials are sources of biological contaminants and hazards.
- Biological contaminants present in food can be reduced or eliminated by thermal processing.

Application of learning 1.3.

Go in food processing plant nearby your school that process fruits into jam and jelly and categorize biological contaminants and hazards found there.

Learning outcome 1 end assessment

Theoretical assessment

1. In table below match each term with its corresponding meaning and provide your answer in designed space.

Answers	Terms	Meaning
1……	1) A food hazard	A. The introduction or occurrence of a contaminant in food or food environment
2……..	2) Contamination	B. Assurance that food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use.
3……	3) Food hygiene	C. A biological, chemical or physical agent in a food with the potential to cause adverse health effects
4……	4) Food contaminants	D. A biological or chemical agent, foreign matter, or other substances not intentionally added to food which may compromise food safety or suitability.
5……	5) Food safety	E. All conditions and measures necessary to ensure the safety and suitability of food at all stages of the food chain.

2. Answer by true or false
    a) Agricultural compounds may be the biological food contaminant that comes from raw materials processed.
    b) Biological contaminants can reduce product shelf life by causing food spoilage
    c) Microorganisms in the air can contaminate foods during processing, packaging, storage, and preparation.
    d) Some physical contaminants and hazards are identified by using organoleptic test mainly nose for smelling.
    e) Chemical contaminant result in food chemical poisoning and injury to consumers

f) Physical contaminant is an object that is not designed for consumption and somehow ends up in a food item or meal. These can be man-made items or those of organic origin.

g) Physical contaminants are not usually result from accidental contamination and /or poor food handling practices at some stage of the production or preparation process.

3. The following are examples of direct biological food contaminants except

    a. Bacteria
    b. Stone
    c. Virus
    d. Yeasts
    e. Protozoa

4. From the following choose the sources of physical contaminants and hazards

    i. Environment
    ii. Soil
    iii. Bacteria
    iv. Mould
    v. Waste
    vi. workers
    vii. Yeast
    viii. Equipment
    ix. Protozoa

5. By using the terms in bracket (**Food infections, Food poisoning, Food spoilage, indirect biological contamination, Food intoxication**) fill in the following empty spaces with the appropriate one.

    a. Foodborne illness caused by eating food that contains toxins made by microbes or chemical poisons. Is called **…….**
    b. Food poisoning caused by toxins from microorganisms. Is called **…….**
    c. Metabolic process that causes foods to be undesirable or unacceptable for human consumption. Is called …….
    d. The process that an organism spread or shed the real contaminants or hazards (pathogenic microorganisms, physical particles...) on food when they sit on food, bite the food, chew the food, walk on food or leave their droppings on food. Is called…….
    …….
    e. Illnesses that are not caused by bacterial by-products, such as toxins, but through ingestion of infectious microorganisms is called **……..**

6. Distinguish microbiological from Macro biological group of microorganisms by showing how they are identified in food products

Practical assessment

IZUBA BAKERY is a company located in Western province, Rubavu district, The store keeper found 30 breads spoiled in the store room due to poor handling and poor storage conditions. As a food processing assistant technician, observe, IZUBA bakery bread and help them to identify types of contaminants in those breads, the task will be performed within 1 hour.

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Hair cover
Face mask
Overall
Gloves
Boots

Indicative contents
2.1 Maintain personal hygiene **2.2 Cleaning of workplace** **2.3 Waste disposal**

Key Competencies for Learning Outcome 2: Perform Hygienic practices

Knowledge	Skills	Attitudes
• Description of personal behaviour in food processing plant • Explanation of health statements of food handler • Description of personal protective equipment • Description of types of cleaning agents • Differentiation of tools and equipment used in Cleaning • Description of cleaning methods and techniques • Description of types of food processing wastes • Differentiation of waste disposal methods	• Maintaining personal hygiene • Preparing cleaning agents • Applying cleaning stages • Checking cleanliness of work Area.	• Being responsible while maintaining personal hygiene • Being prudent while preparing cleaning agents • Being motivated while cleaning • Being attentive while checking cleanliness of the workplace

Duration: 10hrs

Learning outcome 2 objectives:

By the end of the learning outcome, the trainees will be able to:

1. Describe correctly personal behaviour in food processing plant
2. Explain clearly health statements of food handler in food processing plant
3. Describe properly personal protective equipment for a food handler
4. Maintain appropriately personal hygiene in food processing plant
5. Describe clearly types of cleaning agents to clean to workplace
6. Prepare effectively cleaning agents to clean a workplace
7. Differentiate correctly tools and equipment used in Cleaning of workplace
8. Describe clearly cleaning methods and techniques used to clean workplace
9. Apply correctly cleaning stages for cleaning workplace as required in food processing plant
10. Check carefully cleanliness of working Area as required in food processing plant
11. Describe appropriately types of food processing wastes in food processing plant
12. Differentiate correctly waste disposal methods in food processing plant

Resources

Equipment	Tools	Materials
● PPE ● Sink ● Hand drier Machine ● Incinerators	● Basins ● Bins ● Mops ● Squeegee ● Brushes ● Flip-chart stand	● Sanitizers ● Disinfectants ● Degreasers ● Clean Water ● Flip-chart ● Markers ● Pens ● Chalks

Indicative content 2.1: Maintaining Personal Hygiene

Duration: 3hrs

Theoretical Activity 2.1.1: Description of personal hygiene practices

Tasks:

1: Answer the following questions:

i. What do you understand by

   b. Hygiene?

   c. Food handler?

i. What could be the purpose of maintaining personal hygiene?

ii. What do you think are bad habits in food processing plant?

iii. To respect cleanliness habits for persons handling food, at which time do you think person handling food should wash hands?

iv. How could be health statement of food handler in order to ensure that food is not contaminated?

v. Outline the personal protective equipment required in maintaining personal hygiene practices that you know.

2: Provide the answers to asked questions by writing them on papers, flip chart, Blackboard or white board.

3: Present the findings/answers to the whole class.

4: For more clarifications read key reading 2.1.1

Key readings 2.1.1.: Description of personal hygiene practices

- **Definition of hygiene**
  - ✓ **Hygiene** refers to the set of practices associated with the preservation of health and healthy living. Personal hygiene may be described as the principle of maintaining cleanliness and grooming of the external body.
    The focus is mainly on personal hygiene that looks at cleanliness of the hair, body, hands, fingers, feet and clothing
- **Purpose of personal hygiene**
  - ✓ Maintaining hygiene practices reduces the spread of illness commonly spread through viruses and bacteria.
  - ✓ It also increases self-confidence and positively impacts personal relationships.

- ✓ Good hygiene is an important barrier to many infectious diseases, including the faecal–oral diseases
- ✓ It promotes better health and well-being.
- ✓ Ensure social and professional acceptance.
- ✓ Prevent pain.
- ✓ Keep all parts of the external body clean and healthy.
- ✓ Maintain both physical and mental health

- **Behaviour in food processing plant for a food handler**
  - ✓ **A food handler** is anyone who works in a food business and who handles food, or surfaces that are likely to be in contact with food.
  - ✓ **Bad personal habits in food processing plant**
    - Coughing or sneezing on food,
    - Scratching
    - Spitting,
    - Smoking,
    - Chewing gum
    - Touching money
    - Touching hair
    - Using the phone
    - Taking food inside food handling facilities etc

    Personal bad habits can be a source of contamination to foods.
  - ✓ **Cleanliness habits**

    For persons handling food directly, unclean hands are usually the most possible way of transferring contaminants and hazards to food.

    Therefore, hands should be washed according to instructions and indicating hand washing signs and posts. Hands should be washed in designated hand washing sinks or stations in all food handling areas and in restrooms. Such hand washing facilities should be provided with running water, soap, and means to dry hands. A waste container at the hand washing facility is also necessary.

    For food handling persons, hands are washed:
    - **Before:**
      - Consume foods or drinks
      - Before starting work
      - Before putting on or changing gloves
    - **After:**
      - Blow your nose, sneezing, coughing, or using a handkerchief or tissue
      - Touch visibly dirty surfaces, or when there's visible dirt on your hands
      - Handle money or receipts
      - Shake hands with others

- Touch animals, animal feed, or waste
- Moving products or materials from one area to another
- Using the toilet
- Touching hair, face, or body
- Smoking, eating, drinking, or chewing gum or tobacco
- Handling raw materials
- Any clean up activity such as sweeping, mopping, or wiping
- Touching dirty machines, equipment, or utensils
- Handling trash

- **Health statements of food handler.**
  People handling food must practice appropriate person hygiene in order to ensure that food is not contaminated from their dirty clothing or unclean body parts.
  - ✓ All people handling food should:
    - Report to work clean and in good health
    - Dress in appropriate clean attire
    - Keep fingernails trimmed and maintained so that the edges are cleanable and not rough
    - Wear no nail varnish or false nails
    - Keep long hair tied back or enclosed within a cap
    - Use company provided boots and other required protective gear
  - ✓ **Five characteristics for safe food handler:**
    - Keep clean

- Separate raw and cooked
- Cook thoroughly
- Keep food at safe temperatures
- Use safe water and raw materials
- Pass a medical screening before being recruited and undergo periodic and regular medical examination.

To avoid food contamination from persons handling food due to disease conditions or due to other disabilities, persons working in food handling facilities should pass a medical screening before being recruited and undergo periodic and regular medical examination.

The medical screen before recruitment includes: physical fitness, manual handling capabilities, good eye sight, mental ability to carry out instructions and absence of any infectious diseases. Periodic and regular medical examinations should be checked especially for the disease conditions. However, any food handler should report and not wait for regular medical examination when exhibiting symptoms from disease conditions.

Practical Activity 2.1.2: Maintaining personal hygiene

Task:

1: Referring to the previous theoretical activities (2.1.1 and 2.1.2), As a food processing assistant technician, you are asked to go in the food processing workshop and respect maintaining personal hygiene practice.

3: Present out the procedure of maintaining personal hygiene in food processing workshop

4: Referring to the procedure provided on task 3, maintaining personal hygiene practice

5: Present your work to the trainer and whole class. Ask clarification where necessary

6: Read key reading 2.1.2

7: Perform the task provided in application of learning 2.1

Key reading2.1.2: Maintaining personal hygiene

- **For food handling persons, hands should be washed as follows:**

  - ✓ Wet your hands with clean water. If possible, running water is used.
  - ✓ Apply enough detergent to cover all surfaces of your hands and wrists
  - ✓ Lather and rub your hands together briskly and thoroughly. Make sure to scrub all surfaces of your hands, fingertips, fingernails and wrists
  - ✓ Scrub at least 20 to 60 second
  - ✓ Rinse your hands and wrists under preferably running water
  - ✓ Dry your hands and wrists with a clean towel, or air dry

- **Using hand sanitizers, food handling persons should follow these recommendations:**

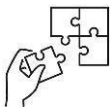
  - ✓ Use hand sanitizers only after hands have been properly washed and dried.
  - ✓ Use only hand sanitizers that comply with any stated Food Code requirements.
  - ✓ Confirm with the manufacturers that the hand sanitizers used meet these requirements.
  - ✓ Use hand sanitizers in the manner specified by the manufacturer

- **Personal protective equipment**

Well maintained and clean personal protective clothing prevents a food handling person from contaminating food. Each food handling person should be provided with a minimum two pairs of work uniforms which include: gloves, aprons, hair nets, face masks, overcoat and safety boots.

Points to Remember

- Personal handling food should keep clean hair, body, hands, fingers, feet and clothing because they are the main source of food contamination.
- Food handling person should wear personal protective equipment such as gloves, aprons, hair nets, face masks and safety boots to maintain safety food.
- Avoid the following bad habits in food processing plant; coughing, sneezing, spitting, scratching, smoking, chewing gum, scratching touching money, hair, phone, and take food/drink because they can cause contamination food.
- For persons handling food directly, unclean hands are usually the most possible way of transferring contaminants and hazards to food. Therefore, hands should be washed according to instructions and indicated hand washing signs and posts.



Application of learning 2.1

Go to the Milk processing plant nearly school and respect person hygiene practice

.

Indicative content 2.2: Cleaning of the Workplace

Duration: 4hrs

Theoretical Activity 2.2.1: Description of cleaning the workplace

Tasks:

1: Answer the following questions

i. What do you understand by?
   a. Cleaning
   b. Sanitizing
   c. Disinfecting
   d. Sterilize
   e. Cleaning agents
ii. What do you think are the purpose of cleaning workplace?
iii. What could be the types of cleaning products?
iv. Give out examples of cleaning agents used to clean the workplace that you know.
v. What are tools and equipment used for cleaning that you know?
vi. How do you think cleaning agent should be prepared?
vii. What could be cleaning methods for work area cleaning?
viii. What could be stage of cleaning of the working area?
ix. What could be the test used for Checking cleanliness of the working Area?

2: Provide the answers to asked questions by writing them on papers, flip chart, Blackboard or white board.

3: Present your findings/answers to the whole class

4: For more clarification read key reading 2.2.1

Key readings 2.2.1.: Description of cleaning of the workplace

- **Cleaning of the Workplace**
  - ✓ **Definition of key terms**
    - **Cleaning** is the process of removing unwanted substances, such as dirt, infectious agents, and other impurities, from an object or environment.
    - **Sanitizing** is process of killing 99.9% of basic germs and bacteria such as E.coli and salmonella in place such as food contact surface.(kill 99.9 of germs and bacteria)
    - **Disinfecting**: is the process of killing harmful pathogenic organisms or rendering them inert. Inert: it is meant to slow or make stable, having no

action or power to move, or being unreactive. (Kill 100% of germs, bacteria and viruses).

- **Sterilize**: Using a chemical agent, boiling water, or steam to eliminate all microorganisms

- **Purpose of cleaning workplace**
  - ✓ To remove dirt, dust, crumbs, and germs from surfaces or objects.
  - ✓ To control hazardous microorganisms;
  - ✓ To control food chemical contamination;
  - ✓ To control foreign body contamination;
  - ✓ To control allergen cross contact;
  - ✓ To control ingredient / residue / colour / flavour at product changeover;
  - ✓ To avoid pest infestation;
  - ✓ To control chemical residues from cleaning / sanitation regimes;
  - ✓ To assure mechanical operations of equipment
  - ✓ To improve process efficiency (e.g. heat transfer efficiency);
  - ✓ To assure occupational safety;
  - ✓ To satisfy local regulatory requirements;
  - ✓ To meet specific customer requirements;
  - ✓ To meet GFSI (Global Food Safety Initiative) requirements
- **Cleaning agent**
  - ✓ **Cleaning agents** are substances (usually liquids, powders, sprays, or granules) used to remove dirt, including dust, stains, bad smells, and clutter on surfaces.
  - ✓ **Types of cleaning agent**
    - **Acidic cleaning agent:**
      Acidic cleaning agents are mainly used for removal of inorganic deposits Like scaling; hard water deposits and rust stains.
      Hydrochloric acid (also called muriatic acid) is a common mineral acid typically used for concrete. Vinegar can also be used to clean hard surfaces and remove calcium deposits.
    - **Alkaline cleaning agent:**
      Alkaline cleaning agents contain strong bases like sodium hydroxide or potassium hydroxide. Alkaline cleaners dissolve fats, oils and protein-based substances. Bleach (pH 12) and Ammonia (pH 11) are common alkaline cleaning agents.
    - **Neutral cleaning agent:**
      Neutral washing agents are pH-neutral and based on non-ionic surfactants that disperse different types of dirt.
      e.g: Water

✓ **Preparation of cleaning agent**

The standard practice is to use either distilled water or deionized water to prepare most reagent solutions. It is critical to read and follow the safety instructions on any product you use. Below are the most important safety guidelines when using sanitizing products:

- Never mix bleach with ammonia or any other cleaner.
- Wear rubber or other non-porous boots, gloves, and eye protection.
- Try not to breathe in product fumes. If using products indoors, open windows and doors to allow fresh air to enter.

✓ **Safety precautions of cleaning**

- Read product and equipment labels and usage instructions before starting to clean
- Wear recommend PPE
- Worker must know which cleaning chemicals must be diluted and how correctly dilution is,
- Thoroughly reviewing and training workers on the use, storage for cleaning chemicals
- Handling in a sanitary manner in order to protect its shelf-life
- Providing workers with a place to wash up after using cleaning chemicals
- Operating ventilation systems as needed to allow sufficient air flow and to prevent build-up of hazardous
- Warning workers not to mix cleaning products that contain bleach and ammonium

- **Tools and equipment used in Cleaning**
  - ✓ Sponges and scourer
  - ✓ Yellow dusters/microfiber cloths.
  - ✓ Glass polishing cloths.
  - ✓ Cleaning brushes.
  - ✓ A mop and bucket.
  - ✓ A dustpan and brush.
  - ✓ Protective gloves.
  - ✓ A plastic caddy to carry the essentials.
- **Application of cleaning methods**

  There are two methods of cleaning:
  - ✓ **Dry Cleaning** is cleaning method that involves the removal of soil particles from surfaces without the use of water or liquid-based cleaning agent.
  - ✓ **Wet cleaning**

    Wet cleaning: It is a process of cleaning that uses water as liquid.
- **Application of Cleaning Techniques**

  There are two techniques of cleaning:
  - ✓ **CIP**

    Cleaning in place (CIP) is a set of activities conducted to properly clean all or part of a process system as it sits in place, without removing or disassembling piping or equipment to accommodate the cleaning.
  - ✓ **COP**

    Cleaning Out of Place is defined as a method of cleaning equipment items by removing them from their operational area and taking them to a designated cleaning station for cleaning. It requires disassembling the apparatus, washing it in a central washing area using an automated system
- **Cleaning Stages** The six stages of cleaning are:
  - ✓ **Pre-Clean**

    To remove loose debris and substances from the contaminated surface to be cleaned. It is done by wiping or rubbing with a disposable towel, sweeping, or rinsing.
  - ✓ **Main Clean**

    To remove loosen any substances, dirt, grease, and debris that has been not removed during the pre-clean stage. This involves using clean water and a detergent in help with cloth or mop, squeegee
  - ✓ **Rinse**

    To remove all remained substances and detergent after main clean stage by using clean water with a cloth, mop, squeegee, etc.
  - ✓ **Disinfection**

To destroy bacteria and other microorganisms by using heat or a chemical disinfectant for an adequate contact time. It is recommended to follow the instructions for any products or equipment to be used.

- ✓ **Final Rinse**
  To remove any disinfectants from the previous stage using clean, hot water. This step may not always be carried out however, depending on the disinfectant and surface to be cleaned. As stated in the previous stage, follow the manufacturer's guidance and seek further advice if needed.
- ✓ **Drying**
  To dry the surface and it's recommended that to use an air dry where possible and the use of drying cloths if needed, but they should be single use if so, especially in a commercial setting. It is not allowed to use air dry on any drying cloths that are damp from use and reuse them, as bacteria could grow on the cloths and pose a contamination risk

- **Checking the cleanliness of the working Area**
  - ✓ **Visual Inspection** (Best Verification Method) Surface appearance: visible debris, soil build-up, color of equipment surface (white films, stains, etc.), biological growth (i.e., mold) and odor.
  - ✓ **ATP testing**: Adenosine Triphosphate is the enzyme that carries chemical energy around living cells. The presence of ATP on a surface indicates that there's life, and in a food processing environment "life" also means potentially dangerous microorganisms. With this type of tests, first a sanitized surface is swabbed. The sample is then activated with an enzyme called luciferase (the one that makes fireflies glow in the dark). The amount of light that is produced by the reaction (measured with a portable device) will be a direct indication of the amount of ATP. The effectiveness of ATP testing is also its limit, meaning that it will be ineffective with nonliving cells, such as yeast extract.
  - ✓ **Riboflavin testing:** Riboflavin (known as vitamin B_2) is a quick, effective and food grade way to uncover them. Before cleaning, the whole surface or at least the difficult to clean part of the surface is sprayed with a riboflavin and dye solution, which becomes fluorescent under UV light. After the cleaning is done, the operator will check with a UV lamp if any areas remained untouched.
  - ✓ **SWAB test:** Swab testing is a rapid and easy-to-use method for collecting samples from food contact surfaces and other environmental surfaces. It is a valuable tool for monitoring food safety and hygiene. Swab tests can be used to detect a wide range of microorganisms, including bacteria, yeasts, and molds.
  - ✓ **The phenolphthalein test**:

is a chemical test used to detect the presence of alkaline residues on surfaces. Alkaline residues can be left behind by cleaning products, disinfectants, and other chemicals. If alkaline residues are not properly removed, they can contaminate food and cause foodborne illness.

- ✓ To perform the phenolphthalein test, you will need a phenolphthalein indicator solution and a sterile swab:
  - Dip the swab into the phenolphthalein indicator solution.
  - Rub the swab over the surface to be tested.
  - If the swab turns pink, it indicates that alkaline residues are present.
  - If the swab does not turn pink, it indicates that alkaline residues are not present

Practical Activity 2.2.2: Cleaning of work area and checking Cleanliness

Task:

1: Referring to the previous theoretical activities (2.2.1) you are requested to go to the food processing workshop clean and check the cleaning effectiveness of the workplace.

2: Apply safety precautions (wear PPE).

3: Present out the procedure of cleaning workplace and how checking the cleaning effectiveness.

4: Referring to the procedure provided on task 3, clean and checks the cleanliness of the workplace.

5: Present your work to the trainer and whole class. Ask clarification where necessary

6: Read key reading 2.2.2

7: Perform the task provided in application of learning 2.2

Key readings 2.2.2: Cleaning of work area and checking Cleanliness

- **Stages of Cleaning**
  - ✓ Pre-Clean.
  - ✓ Main Clean
  - ✓ Rinse
  - ✓ Disinfection
  - ✓ Final Rinse
  - ✓ Drying

- **Techniques of Checking the cleanliness of the working Area**
  - ✓ **Visual Inspection (Best Verification Method) Surface appearance:**
    - Prepare the inspection area
    - Identify the critical surfaces.
    - Inspect the surfaces
    - Record the results of the inspe ction
  - ✓ **ATP testing: Adenosine Triphosphate**
    - Collect a sample
    - Place the swab in the ATP test device
    - Add the ATP reagent to the sample
    - Read the results
  - ✓ **Riboflavin testing: Riboflavin (known as vitamin B_2)**
    - Prepare the riboflavin solution.
    - Mix 1 gram of riboflavin with 10 liters of water in a clean polyethylene container.
    - Apply the riboflavin solution to the surface to be tested. This can be done using a spray bottle, brush, or other method.
    - Inspect for the coverage
    - Clean the place
    - Inspect the area after cleaning
    - Any remaining fluorescence indicate residual riboflavin(which indicate insufficient cleaning)
  - ✓ **Phenolphatein test**
    - Take 5ml of final rinsing water
    - Mix with 5 ml of phenolphthalein indicator
    - Coloress result indicate effective cleaning while purple color indicate insufficient cleaning

Points to Remember

- When using cleaning agent read and follows the safety instructions given by manufacture.
- Never mix bleach with ammonia or any other cleaner because it can lead to a dangerous chemical reaction that produces toxic gases, specifically chloramine gas which can result in serious health issues.
- Wear rubber or other non-porous boots, gloves, and eye protection.
- Try not to breathe in product fumes. If using products indoors, open windows and doors to allow fresh air to enter.

Application of learning 2.2.

Go in workshop and prepare cleaning product, clean the workshop and check cleanliness

Indicative content 2.3: Waste Disposal

Duration: 3hrs

Theoretical Activity: 2.3.1 Description of Food Processing Waste

Tasks:

1: Answer the following questions:

i. What do you understand by
   a. Waste
   b. Food wastes
   c. Waste management
ii. What could be the purpose of disposing waste in food industry?
iii. Give out types of food processing wastes that you know?
iv. What could be regulations of waste disposal?
v. What could be waste disposal methods?

2: Provide the answers to asked questions by writing them on papers, flip chart, Blackboard or white board.

3: Present your findings/answers to the whole class

4: For more clarification read key reading 2.3.1

Key readings 2.3.1. Description of Food Processing Waste

- **Definition of key terms**
  - ✓ **Waste** is a material which has served its original intended use and sometimes discarded after primary use, or it is worthless, defective and of no use.
  - ✓ **Food wastes** are usually organic residues produced by the processing of raw materials into food.
  - ✓ **Waste management** or waste disposal includes the processes and actions required to manage waste from its inception to its final disposal. It involves the processes of waste collection, transportation, processing, as well as waste recycling or disposal.

- **Purpose of waste disposal**
  - ✓ Waste management or handling waste is important for any food processing industry in order to:
  - ✓ Provide hygienic
  - ✓ Avoid cross-contamination to the food products from waste
  - ✓ Prevent harmful effects of waste to the environment
  - ✓ Recycle waste into various useful products
  - ✓ Be able to use waste as manure for example
  - ✓ Use waste for energy generation (Biogas).
  - ✓ Help in improving air and water quality as well as reduces greenhouse gas emissions
- **Types of Food Processing Waste**
  - ✓ **Types of waste based on state**
    - **Solid waste**: Solid waste is all rotting and non-rotting waste in solid or semi-solid form. Example: Fruit peels, plastics, glass…
    - **Liquid waste**: Liquid waste is non-solid material that has no further use and must be treated and disposed of according to local, state, and federal regulations. Example: Whey, Wash/cleaning water, Effluent from industries…
    - **Gaseous waste**: These are the wastes that are released in the form of gases. Example: Smokes, CO2, CO…
  - ✓ **Types waste based in nature and characteristics**
    - **Biodegradable waste**
      - These are the wastes that come from our kitchen and it includes food remains, garden waste, etc. Biodegradable waste

is also known as moist waste. This can be composted to obtain manure. Biodegradable wastes decompose themselves over a period of time depending on the material.

- **Non-biodegradable waste**
  - These are the wastes which include old newspapers, broken glass pieces, plastics, etc. Non-biodegradable waste is known as dry waste. Dry wastes can be recycled and can be reused. Non-biodegradable wastes do not decompose by themselves and hence are major pollutants.

✓ **The differences between biodegradable waste and non-biodegradable waste:**

SN	Biodegradable waste	Non Bio-degradable waste
1	The degradable process is fast	the degradable process is slower than in biodegradable
2	Biodegradable waste is decomposed and degraded by microbes or microorganism	Non-biodegradable waste cannot be composed by microbes or naturally
3	Biodegradable waste is not collected but is used up in a short time	Non-biodegradable waste is often collected
4	Biodegradable waste has become part of biogeochemical cycles and give back quick turnover	Most of non-biodegradable waste can never enter biogeochemical cycles, very slow and more harmful for the earth
5	Biodegradable waste can be used to generate energy as a compost and biogas	Non-biodegradable waste can be separated and recycled but the process is very costly

✓ **Waste management equipment and tools**

Different kinds of materials and equipment are used to collect and manage waste. They include:

- Sacs
- P.P.E
- Waste bins
- Buckets
- Wheelbarrow
- Aspirators
- Waste digester
- Trucks
- Tractor
- Pipelines
- Waste containers
- Waste stream separators
- Driers

- Waste collection, storage and disposal system/line (pipes, drainage channels, pits)

- **Regulations of waste disposal**

  Regulations of waste disposal are:

  - ✓ Organize house-to-house collection of solid wastes through house-to-house collection on regular pre-informed timings;
  - ✓ Remove garbage from where it was generated, directly to transporting trucks and thereafter to the disposal sites;
  - ✓ Clean the bins or containers wherever placed before they start overflowing;
  - ✓ Collect separately biodegradable waste in nature emanating from slaughter houses or meat and fish markets, with other waste; and
  - ✓ Separate Bio-medical waste and industrial waste with solid waste.

- **Waste disposal Methods**

  Waste handling according to types of waste, the following are some of the methods that are used today:

  1. **SOLID WASTE**
     - **Sanitary Landfill**

       Involves the disposal of solid waste into specially designed areas known as sanitary landfills. It is a process where waste materials, such as household garbage, construction debris, and industrial waste, are carefully deposited and compacted in designed locations and this is developed due to anaerobic decomposition. Landfills are engineered sites with measures in place to minimize the impact on the environment and public health. This process start by selecting suitable land for the landfill site, considering factors such as distance from residential areas, water sources, and geological stability.
     - **Incineration**

       Incineration is the process of burning garbage/waste materials to reduce it to incombustible matter such as ash and waste gas.

       The exhaust gases from this process may be toxic; hence it is treated before being released into the environment. This process reduces the volume of waste by 90 per cent and is considered as one of the most hygienic methods of waste disposal. In some cases, the heat generated is used to produce electricity. However, some consider this process, not quite environmentally friendly due to the generation of greenhouse gases such as carbon dioxide and carbon monoxide.
     - **Waste Compaction**

       The waste materials such as cans and plastic bottles are compacted into blocks and sent for recycling. This process prevents the oxidation of metals and reduces airspace need, thus making transportation and positioning easy.
     - **Recycling:**

       Serves to transform the wastes into products of their own genre through industrial processing. Food waste that is no longer edible still has value. It is environmentally friendly to reuse the wastes instead of adding them to nature.
     - **Biogas Generation**

Biodegradable waste, such as food items, animal waste or organic industrial wastes from food packaging industries are sent to bio-degradation plants. In bio-degradation plants, they are converted to biogas by degradation with the help of bacteria, fungi, or other microbes. Here, the organic matter serves as food for the micro-organisms. The degradation can happen aerobically (with oxygen) or anaerobically (without oxygen). Biogas is generated as a result of this process, which is used as fuel, and the residue is used as manure.

- **Composting**

  it is the biological decomposition of organic waste such as food material by bacteria, fungi, worms and other organisms under controlled aerobic (occurring in the Presence of oxygen) conditions. The end result of composting is an accumulation of partially decayed organic matter called humus. This results in the formation of nutrient-rich manure. Also, this process ensures that the nutrients are replenished in the soil. Besides enriching the soil, composting also increases the water retention capacity. In agriculture, it is the best alternative to chemical fertilizers.

- **Feed Animals**

  Some food product wastes can be dried and ground for animal feed. Examples are the liquid waste from tomato processing, the residue from alcohol manufacture, citrus wastes, processed whey, and rendered animal by-products.

2. **Liquid Waste**

There are several ways of treating sewage and other wastewaters with different costs and requirements. One that is particularly effective and economical in warm regions of the world is waste stabilization ponds**.**

Wastewater treatment can be undertaken using a sequence of processes in a mechanical biological system. This treatment is faster than using natural systems such as waste stabilization ponds or reed beds and requires less space. However, mechanical-biological systems are more expensive because of the equipment required and the need for skilled personnel to operate them.

Points to Remember

- Food processing industry should consider waste management system in order to prevent the waste effects on food.
- In Food processing biodegradable and no biodegradable waste are kept separately because no biodegradable wastes do not decompose are major pollutants.

Application of learning 2.3.

You are asked to go in the waste disposal site in our school and separate biodegradable from no biodegradable waste.

Learning outcome 2 end assessment

Theoretical assessment

1. You are going to clean the oil that was drained on the floor, what is the cleaning method to be used?
2. Write in appropriate order the following steps or procedure for hand washing.
   a. Apply liquid soap or detergent.
   b. Drying hands well.
   c. Rinse hands thoroughly with clean water.
   d. Rub hands together between fingers, thumbs and wrists.
   e. Select appropriate detergent.
   f. Wet hands with water.
3. Match the terms bellow with their corresponding meaning

Answer	terms	Meaning
1……..	1. **A food handler**	**A.** Using a chemical agent, boiling water, or steam to eliminate all microorganisms.
2……..	1. **Personal hygiene**	**B**. The process of killing harmful pathogenic organisms or rendering them inert (it is meant to slow or make stable, having no action or power to move, or being unreactive. (Kill 100% of germs, bacteria and viruses).
3……	2. **Sterilize**	**C.** Maintaining an appropriate degree of personal cleanliness and behaves and operates in an appropriate manner in food processing plant or industry.
4……	3. **Disinfecting**	**D.** process of killing 99.9% of basic germs and bacteria such as E.coli and salmonella in place such as food contact surface.(kill 99.9 of germs and bacteria)
5……	4. **Sanitizing**	**E.** Anyone who works in a food business and who handles food, or surfaces that are likely to be in contact with food.
		F. The process of removing unwanted substances, such as dirt, infectious agents, and other impurities, from an object or environment.

4. Critical limits must involve measurable parameters and may also be known as the absolute tolerance or safety limit for CCP. Choose some examples of critical limit

1. Pasteurization□
2. Time□
3. Cooking□
4. Temperature□
5. Measuring moisture content□
6. pH □

5. Write True or False to the following:

i. To remove dirt, dust, crumbs, and germs from surfaces or objects is only the purpose of cleaning workplace in food processing industry.

ii. IT is advised to mix bleach with ammonia or any other cleaner when preparing cleaning agent.

iii. Operating ventilation systems is needed to allow sufficient air flow and to prevent build-up of hazardous

6. Visible debris, soil build-up, colour of equipment surface (white films, stains, etc.) is checked by ATP testing.
   True
   False□
7. In the following table there is description (column) and related terms (raw). Read carefully and match the description with the corresponding one.

Description	**Food wastes**	**Waste**	**Waste management**
Is a material which has served its original intended use and sometimes discarded after primary use, or it is worthless, defective and of no use.			
Organic residues produced by the processing of raw materials into food.			
or waste disposal includes the processes and actions required to manage waste from its inception to its final disposal. It involves the processes of waste collection, transportation, processing, as well as waste recycling or disposal.			

Practical assessment

Task:

XYZ company located in Kayonza district, processes fruits into juice. However, checking the cleanliness of the work area showed that cleaning was not efficient and the company was asked to stop working till they improve cleanliness. You are requested to help the company to improve hygiene in the food processing industry. the work will be done in 1hour. Cleaning materials, tools and equipment are available in store room.

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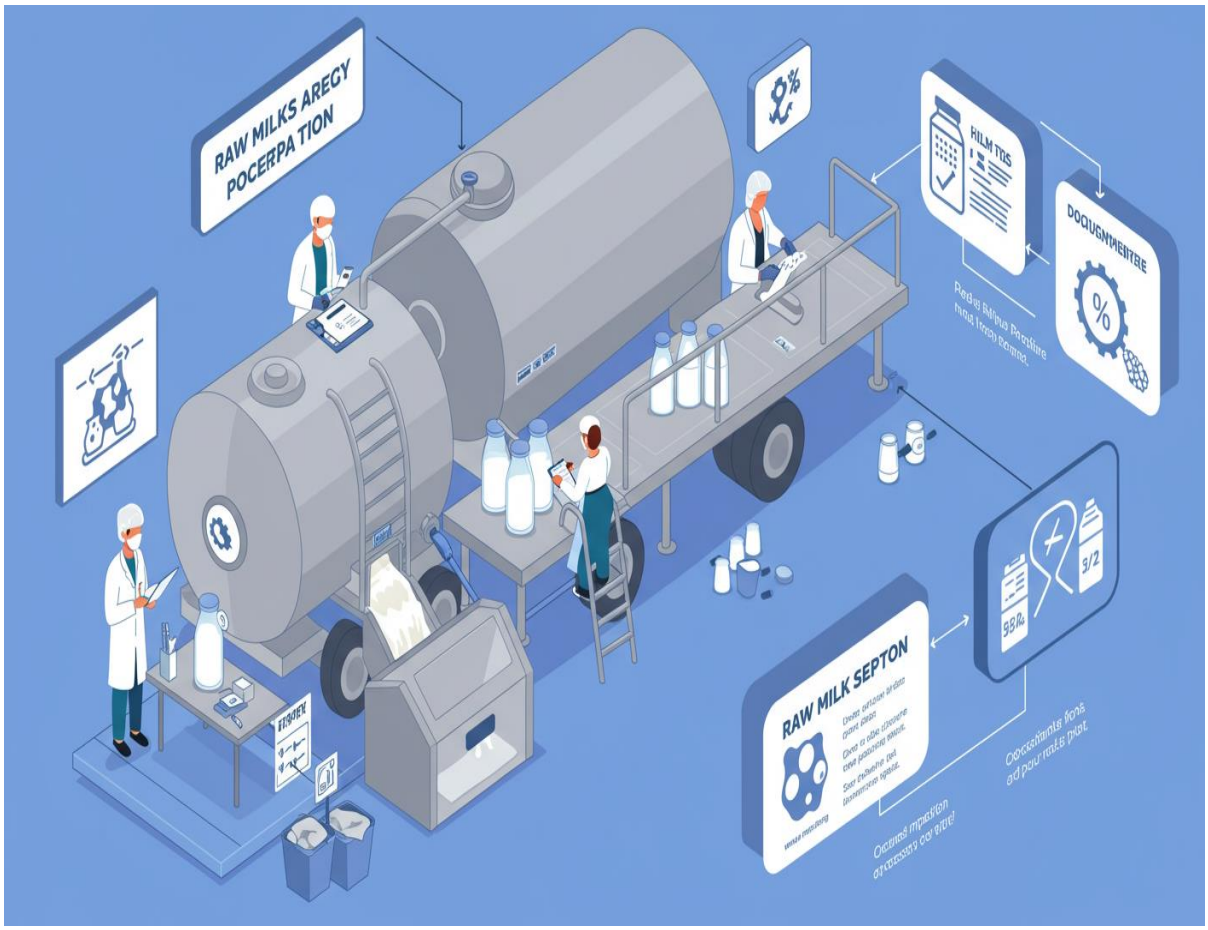

RAW MILKS AREGY
POCERPA TION
RAW MILK SEPTON

Indicative contents
3.1 Implementation of preventive measures for contaminants **3.2 Controlling pest in food processing plant** **3.3 Respecting Critical Control Point**

Key Competencies for Learning Outcome 3: Implement food safety

Knowledge	Skills	Attitudes
● Description of Administrative control measures ● Description of Engineering control measures ● Description of Controlling Exposure ● Description of food preservation Techniques ● Identification of potential pest ● Description of pest control measures ● Description of CCP	● Applying pest control measures ● Respecting Critical control point	● Being attentive while applying pest control measures ● Being prudent while monitoring CCP

Duration: 20hrs

Learning outcome 3 objectives:

By the end of the learning outcome, the trainees will be able to:

1. Describe clearly administrative control measures for contaminants
2. Describe correctly engineering control measures for contaminants
3. Describe controlling Exposure for contaminants
4. Describe properly food preservation techniques for contaminants
5. Describe effectively pests control measures in a food processing plant
6. Describe clearly CCP in food processing plant

Resources

Equipment	Tools	Materials
• Air compressor • Pasteurizer • Sterilizer • Sprayers	• Traps, • Bins, • Hummers, • Water bath	• Detergents, • Sanitizers, • Water, • Preservatives, • CCP Guidelines, • UV light Bulbs, • Fumigants tables, • Insect nets, • Nails, • Chalks, • Flip-charts, • Pens

Indicative content 3.1: Implementation of Preventive measures for contaminants

Duration: 10hrs

Theoretical Activity 3.1.1: Description of implementation of preventive measures for contaminants. contaminants

Tasks:

1: Answer the following questions:

i. What do you understand by
   a. Administrative control measure of food contaminants?
   b. Engineering control measures of food contaminants?
   c. Controlling Exposure of food contaminants
   d. Food preservation Techniques

ii. What could be the techniques used for food preservation

2: Provide the answers to asked questions by writing them on papers, flip chart, Blackboard or white board.

3: Present your findings/answers to the whole class

4: For more clarification read key reading 3.1.1

Key readings 3.1.1.: Description of Implementation of Preventive measures for contaminants

- **Implementing Administrative control measures**

  Administrative controls are modifications or changes to work practices or behaviours in order to reduce the severity or impact of a hazard.

  Administrative controls involve developing procedures to ensure the work conducted in a way that minimizes the hazard.

  Examples include developing or changing policies, implementing or improving training and education, and developing or enhancing work practices and procedures.

  ✓ **Methods of administrative control include:**
  - Using job-rotation schedules or a work-rest schedule
  - Scheduling maintenance and other high exposure operations for times when few workers are present (such as evenings, weekends).
  - Restricting access to a work area

- **Implementing Engineering control measures**

  Engineering controls are methods that will remove the hazard at the source, before it comes in contact with the worker.

  Engineering controls can be built into the design of a plant, equipment, or process to minimize the hazard.

  ✓ **Examples of engineering controls are:**

  - **Isolation** – separating workers from the hazard by distance or the use of barriers
  - **Ventilation** – using local exhaust or general dilution ventilation to remove or reduce airborne products

  ✓ **More information on engineering controls include the following:**

  - **Process Control**

    Process control involves changing the way a job activity or process is done to reduce the risk. Monitoring should be done before and as well as after the change is implemented to make sure the changes did, in fact, control the hazard.

    Examples of process changes include to:

    - Decrease the temperature of a process so that less vapour is released.
    - Use automation - the less workers have to handle or use the materials, the less potential there is for exposure.
    - Use mechanical transportation rather than manual methods

  - **Enclosure and Isolation**

    These methods aim to keep the chemical "in" and the worker "out" (or vice versa).

  - **Ventilation**

    Ventilation is a method of control that “adds" and "removes" air in the work environment

- **Description of Controlling Exposure**

  Controlling exposure is to prevent, or to adequately control, exposure to substances hazardous to health, so as to prevent ill health

  ✓ **Examples:**

  - Using control equipment, eg total enclosure, partial enclosure.
  - Controlling procedures, eg ways of working, supervision and training to reduce exposure, maintenance, examination and testing of control measures;
  - Worker behaviour, making sure employees follow the control measures

- **Application of food preservation Techniques**

Food preservation techniques that are applied in food technology aim generally to reduce or prevent the growth of microorganisms in food.

✓ **Cold preservation (Refrigeration and freezing**)

Refrigeration is a method of storing food materials at low temperatures. It slows down the growth of microorganisms. Food is stored at 5 to 10oC

Freezing is a method of solidifying food materials at a very low temperature to prevent spoilage. In this method low temperature prevents the growth of microorganisms. Food is stored at o degrees Celsius.

✓ **Heat preservation (pasteurization, sterilization)**

Pasteurization is the process of heating the product to a predetermined temperature at a specific time in order to kill pathogenic microorganisms, which may be present.

The sterilization is the process of heating to high enough temperature (usually more than 100oc) for the specific time to kill almost all bacteria.

SN	Point	Pasteurization	Sterilization
1	Application	Kill pathogen microorganisms	Kill all form of microorganisms
2	Temperature	63^{o}C or 72^{o}C	121 ^{o}C
3	Time	30 min / 15 sec	15 sec

✓ **Fermentation**

Fermentation is an anaerobic process in which microorganisms like yeast and bacteria break down food components (eg sugars such as glucose) into other products (eg organic acids, gases or alcohol).

✓ **Using Chemical preservatives**

Chemical food preservatives are substances which, under certain conditions, either delay the growth of microorganisms without necessarily destroying them or prevent deterioration of quality during manufacture and distribution.

Chemical food preservatives include compounds such as sodium benzoate, benzoic acid, nitrites, sulfites, sodium sorbate and potassium sorbate.

✓ **Dehydration**

Dehydration is the process of removing water or moisture from a food product. Dehydration is one of the oldest methods of food preservation for indefinite periods by extracting the moisture, thereby inhibiting the growth of microorganisms.

Points to Remember

- preventive measures for contaminants should be considered to ensure Food safety.

Application of learning 3.1

Go to Soymilk and tofu production factory located. Describe preventive measures for contaminants

Indicative content 3.2: Controlling pest in Food processing plant

Duration: 5hrs

Theoretical Activity 3.2.1: Description of pest control measures in a food plant

Tasks:

1: Answer the following questions:

i. What do you understand by pest in food processing plant?
ii. Give out purpose of pest control in food processing plant that could you know.
iii. How many main groups of pests that are encountered in food business?
iv. What could be the control measures of pests in Food Company?

2: Provide the answers to asked questions by writing them on papers, flip chart, Blackboard or white board.

3: Present their findings to the whole class

4: Read key reading 3.2.1 in trainee manual and ask for clarification to the trainer if any

Key readings 3.2.1.: Description of pest control measures in a food plant

- **Definition of pest**
  - ✓ **Pest:** A destructive insect or other animal that attacks crops, food, livestock, etc.

- **Purpose of Pest control in food processing plant are**
  - ✓ They damage food materials and food packaging
  - ✓ They are the source of microorganisms
  - ✓ Protect your health and wellbeing.
  - ✓ Protect your peace of mind.
  - ✓ Protect your premises and investment.

- ✓ Respect laws and regulations.
- ✓ Protect your income.

- **Identification of Potential pest**

  Potential pests: These pests do not cause any serious economic loss although they possess the innate capacity to do so.

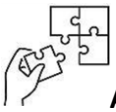
  There are 3 main groups of pests that are encountered in food businesses:
  - ✓ Rodents: rats and mice
  - ✓ Insects: cockroaches, beetles, flies etc
  - ✓ Birds: pigeons, seagulls etc.

- **Application of pest control measures**

  Some of measures need to control pest in food company are:
  - ✓ The exterior walls may contain as less as possible cracks
  - ✓ The pipelines have to not be accessible from outside
  - ✓ The exterior windows have to be provided with insect screen
  - ✓ The company and the outside company need to be kept clean
  - ✓ Apparatus and rooms that are not used need to be clean
  - ✓ The prolonged staying of a poorly of water has to be avoided in the surrounding of a company, Especially on loading and unloading platform, Where their direct entrance to outside or cleaning zone
  - ✓ The unloading and loading gates have to be closed after loading and unloading.
  - ✓ The UV lamps are often used and replaced according to the manufacture instructions

Points to Remember

- Food Company should consider pest control measures not only because pests are sources of microorganisms but also to protect health and wellbeing, peace of mind premises and investment, income and also to respect laws and regulations.



Application of learning 3.2

Bread making factory located near our school has measures of controlling pest in their factory. You asked to identify the pest control measures used in that factory.

Indicative content 3.3: Respecting Critical control point

Duration: 5hrs

Theoretical Activity 3.3.1: Description of a Critical control point

Tasks:

1: Answer the following questions:

i. What do you understand by

a. Critical control point (CCP)?

b. Hazard analysis and critical control point (HACCP)?

ii. Give out examples of critical limits that you know

2: Provide the answers to asked questions by writing them on papers, flip chart, Blackboard or white board.

3: Present the findings/answers to the whole class

4: For more clarification read key reading 3.3.1 in trainee manual

Key readings 3.3.1.: Description of a Critical control point

- **Description of CCP**
  - ✓ **A critical control point (CCP)** is a point, step or procedure at which control can be applied and a food safety hazard can be prevented, eliminated or reduced to acceptable levels.

he application of this principle involves listing the steps in the process and identifying where significant hazards are likely to occur. The HACCP team will focus on hazards that can be prevented, eliminated or controlled by the HACCP plan.

- ✓ **Hazard analysis and critical control (HACCP)** is a system which identifies, evaluates and controls hazards which are significant for food safety. It is an effective tool to prevent adverse health effects (biological, chemical and physical hazards) due to food contamination.
- ✓ **Benefits of implementing HACCP are**
  - Creating a good reputation and boosting customer confidence
  - Increasing business & Swells profits
  - Enhance staff morale and loyalty
  - Continuous improvement of food safety
- ✓ **Identify principles of HACCP**

HACCP: A systematic approach to the identification, evaluation, and control of food safety hazards.

HACCP Plan: The written document which is based upon the principles of HACCP and which delineates the procedures to be followed.

HACCP System: The result of the implementation of the HACCP Plan.

HACCP Team: The group of people who are responsible for developing, implementing and maintaining the HACCP system.

HACCP is based on the following seven principles:

Principle 1: Conduct a hazard analysis.

Principle 2: Determine the critical control points (CCPs).

Principle 3: Establish critical limits.

Principle 4: Establish monitoring procedures.

Principle 5: Establish corrective actions.

Principle 6: Establish verification procedures.

Principle 7: Establish record-keeping and documentation procedures.

- **Principle 1 - Conduct a Hazard Analysis**

  In conducting the hazard analysis, wherever possible the following should be included:

  - The likely occurrence of hazards and severity of their adverse health effects
  - The qualitative and/or quantitative evaluation of the presence of hazards
  - The survival or multiplication of microorganisms of concern
  - The production or persistence in foods of toxins, chemicals or physical agents
  - The conditions leading to the above

- **Principle 2-Identification of CCP**

  The HACCP team will use a CCP decision tree to help identify the critical control points in the process.

A critical control point may control more than one food safety hazard or in some cases more than one CCP is needed to control a single hazard. The number of CCP's needed depends on the processing steps and the control needed to assure food safety.

Examples of critical points that could be determined:

- Pasteurization
- Cooking
- Testing raw material at reception
- Passing food through a metal detector
- Measuring moisture content

- **Principle 3 - Establish Critical Limits**

  A critical limit (CL) is the maximum and/or minimum value to which a biological, chemical, or physical parameter must be controlled at a CCP to prevent, eliminate, or reduce to an acceptable level the occurrence of a food safety hazard.

  The critical limit is usually a measure such as time, temperature, water activity (Aw), pH, weight, or some other measure that is based on scientific literature and/or regulatory standards.

- **Principle 4- Monitor CCP (Establishment of monitoring system)**

  The HACCP team will describe monitoring procedures for the measurement of the critical limit at each critical control point. Monitoring procedures should describe how the measurement will be taken, when the measurement is taken, who is responsible for the measurement and how frequently the measurement is taken during production.

  Established monitoring procedures should include:

  - ✓ What to monitor (ex: parameters such as temperature, time, moisture content...)
  - ✓ How to monitor (ex: taking measurement)
  - ✓ Where in the food handling chain or at which step the monitoring should be carried out
  - ✓ Who is responsible to carry out the monitoring
  - ✓ When (frequency) to carry out monitoring

- **Principle 5 - Establish Corrective Action**

  Corrective actions are the procedures that are followed when a deviation in a critical limit occurs. The HACCP team will identify the steps that will be taken to prevent potentially hazardous food from entering the food chain and the steps that are needed to correct the process. This usually includes identification of the problems and the steps taken to assure that the problem will not occur again.

  Deviation: Failure to meet a critical limit.

Examples of corrective actions that can be taken:

- ✓ Adjusting/restoration of process conditions (ex: right time, right temperature)
- ✓ Re-working the product (Re-cooking, re-pasteurization)
- ✓ Product recall
- ✓ Disposal/destruction of the product or batch of products

- **Principle 6 – Verification (Establishment of verification procedures)**

  Those activities, other than monitoring, that determine the validity of the HACCP plan and that the system is operating according to the plan. The HACCP team may identify activities such as auditing of CCP's, record review, prior shipment review, instrument calibration and product testing as part of the verification activities.

  Examples of verification activities include:

  - ✓ Review of the HACCP system and plan and its records;
  - ✓ Review of deviations and product dispositions;
  - ✓ Confirmation that CCPs are kept under control.

- **Principle 7- Recordkeeping (Establish record keeping and documentation)**

  A key component of the HACCP plan is recording information that can be used to prove that a food was produced safely.

  - ✓ Documentation examples are:
    - Hazard analysis;
    - CCP determination;
    - Critical limit determination.
    - Record examples are:
    - CCP monitoring activities;
    - Deviations and associated corrective actions;
    - Verification procedures performed;
    - Modifications to the HACCP plan.

Points to Remember

- Food processor should consider critical control point (CCP) as a point, step or procedure at which control can be applied and a food safety hazard can be prevented, eliminated or reduced to acceptable levels.

Application of learning 3.3

Go to the factory located nearby our school that process fruits into jam and jelly and identify critical control point in jam and jelly production.

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Learning outcome 3 end assessment

Theoretical assessment

2. For controlling contaminants, they are preventive measures that are to be implemented, match the control measure in (column) with corresponding example in (raw):

	Controlling procedures, eg ways of working, supervision and training	Isolation – separating workers from the hazard by distance or the use of barriers	job-rotation schedules or a work-rest schedule	Fermentation
Administrative control measures				
Controlling Exposure				
Engineering control measures				
Preservation Techniques				

2. Critical limits must involve measurable parameters and may also be known as the absolute tolerance or safety limit for CCP. Choose some examples of critical limit

1) Pasteurization
2) Time
3) Cooking
4) Temperature
5) pH

3. The table below showing Heat preservation (pasteurization, sterilization) method, complete the empty space with the missing one:

SN	**Point**	**Pasteurization**	**Sterilization**
1	Application	Kill pathogen microorganisms	**……**
2	Temperature	63^{o}C or 72^{o}C	**……**
3	Time	……	15 sec

4. Write True or False to the following :

a. The exterior windows have to be provided with insect screen that is the only one measure of controlling pest in food company
b. Insect killers have to be placed to cleaning zone only
c. Pests are grouped into 2 groups in food businesses

5. Write in full the following abbreviations:
   a. CCP
   b. HACCP
6. Arrange in order the following principles of HACCP from the 1st one up to 7th one:

Conduct a hazard analysis.
Determine the critical control points (CCPs).
Establish corrective actions.
Establish critical limits.
Establish monitoring procedures.
Establish record-keeping and documentation procedures.
Establish verification procedures.

References

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END

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