ANIMAL HEALTH CARE SERVICES LEVEL- III

BASED ON MARCH 2018, VERSION 3 OCCUPATIONAL STANDARDS

MODULE TITLE: ASSISTING IN ANIMAL ORIGIN FOOD HYGIENE AND INSPECTION

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East Africa Skills for Transformational and Regional Integration (ESTRIP) Project

Table of Contents

LG 93	LO 1. Follow Animal Origin Food Hygiene Risk Identification and Control Procedures

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Recognizing and reporting risks in animal origin food hygiene
- Using, maintaining and storing PPE
- Implementing safe work practices and OHS procedures
- Disposing wastes

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Recognize and report risks in animal origin food hygiene
- Use, maintain and store PPE
- Implement safe work practices and OHS procedures
- Dispose wastes

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the "Information Sheets". Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the "Self-checks" which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to "Operation sheets
7. Perform "the Learning activity performance test" which is placed following "Operation sheets" ,
8. If your performance is satisfactory proceed to the next learning guide,
9. If your performance is unsatisfactory, see your trainer for further instructions or go back to "Operation sheets".

1.1. Introduction to Food Hygiene Concepts

The consumption of animal proteins is a luxury for most of the world population. Thus, discussions around food safety of products of animal origin mainly relate to concerns of people in developed countries that consume processed and packed foods, usually far removed from the original source.

Food hygiene promote understanding of how rules and regulations on food hygiene are developed and applied. The General Principles of food hygiene cover hygiene practices from primary production through to final consumption, highlighting the key hygiene controls at each stage. This also contains the most internationally used description of the Hazard Analysis and Critical Control Point (HACCP) system and guidelines for its application. Pre-requisite programmes (Good Agricultural Practices (GAP) and Good Hygienic Practices (GHP)) must be working effectively within a system before HACCP is applied. If these pre-requisite programmes are not functioning effectively then the introduction of HACCP will not be effective. In general, poor food hygiene knowledge and frequently engage in unsafe food handling practice lead to foodborne illness.

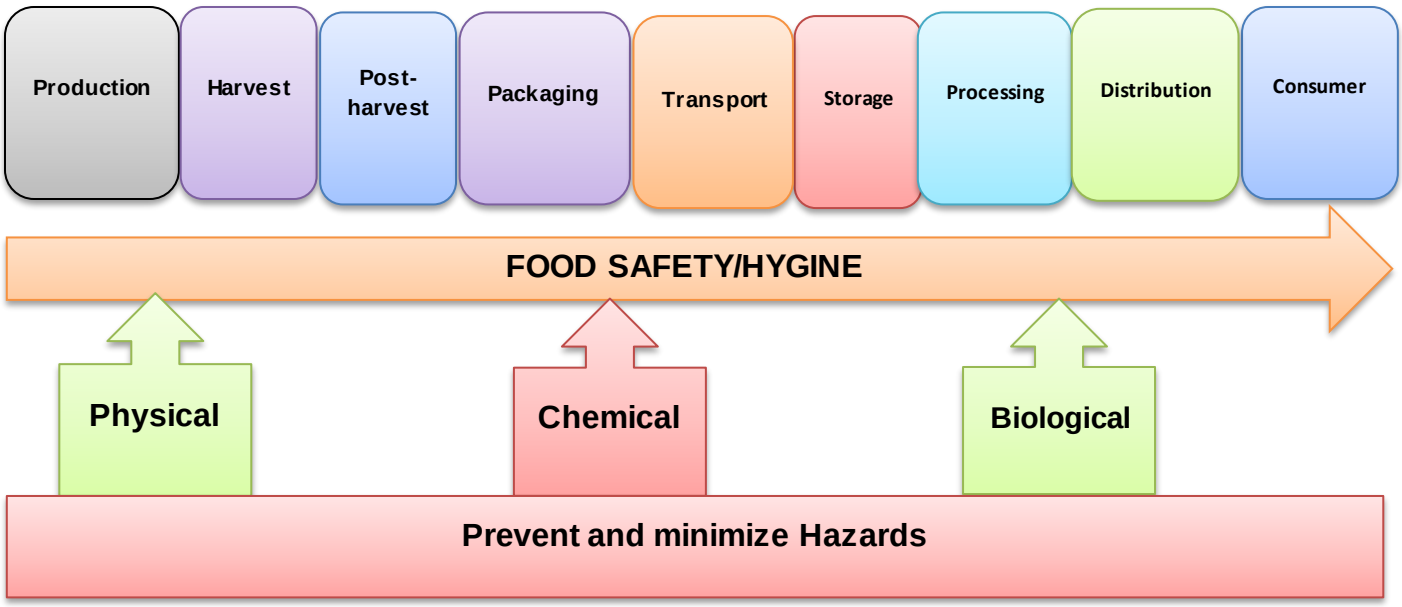

Figure 1. Food safety must be managed across the supply chain

1.2. Definition of Terms Related to Food Hygiene

Food hygiene: All conditions and measures necessary to ensure the safety and suitability of food at all stages of the food chain.

Cleaning: The removal of soil, food residue, dirt, grease or other objectionable matter.

Contaminant: Any biological or chemical agent, foreign matter or other substances not intentionally added to food that may compromise food safety or suitability.

Contamination: The introduction or occurrence of a contaminant in food or food environment.

Hazard: A biological, chemical or physical agent in, or condition of, food with the potential to cause an adverse health effect.

A food hazard is defined as anything that could contaminate food and cause illness or injury, or could otherwise violate established food safety program criteria if left uncontrolled.

Food handler: Any person who directly handles packaged or unpackaged food, food equipment and utensils, or food contact surfaces and is therefore expected to comply with food hygiene requirements.

Food safety: Assurance that food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use.

Food suitability: Assurance that food is acceptable for human consumption according to its intended use.

Hazard Analysis Critical Control Point (HACCP): A system that identifies, evaluates and controls hazards that are significant for food safety.

HACCP is a science-based system which systematically identifies, evaluates, and controls hazards which are significant for food safety. Food safety is addressed through the analysis and control of biological, chemical, and physical hazards from raw material production, procurement and handling, to manufacturing, distribution and consumption of the finished product.

Primary production: Those steps in the food chain up to and including, for example, harvesting, slaughter, milking, fishing.

1.3. Recognizing And Reporting Risks In Animal Origin Food Hygiene

Food safety is a fundamental public health concern, and achieving a safe food supply poses major challenges for national food safety officials. Changing global patterns of food production, international trade, technology, public expectations for health protection and many other factors have created an increasingly demanding environment in which food safety systems operate. An array of food-borne hazards, both familiar and new, pose risks to health and obstacles to international trade in foods. These risks must be assessed and managed to meet growing and increasingly complex sets of national objectives. Risk analysis, a systematic, disciplined approach for making food safety decisions developed primarily in the last two decades, includes three major components: risk management, risk assessment and risk communication. Risk analysis is a powerful tool for carrying out science-based analysis and for reaching sound, consistent solutions to food safety problems. The use of risk analysis can promote ongoing improvements in public health and provide a basis for expanding international trade in foods. Responsibility for food safety is shared by everyone involved with food

from production to consumption, including growers, processors, regulators, distributors, retailers and consumers.

A food-borne hazard is defined by Codex as "a biological, chemical or physical agent in, or condition of, food, with the potential to cause an adverse health effect." Many of these hazards have long been recognized and addressed by food safety controls. A number of new and emerging hazards are also of growing concern.

Components of risk analysis

As a structured decision-making process, risk analysis includes three distinct but closely connected components: risk management, risk assessment and risk communication. Each of these components plays an essential and complementary role in the risk analysis process. Although, risk management and risk communication tended to receive less attention than risk assessment in the past, it is important to stress that risk analysis will only be effective when all three components are successfully integrated.

Figure 2. Components of risk analysis

Risk analysis: A process consisting of three components: risk assessment, risk management and risk communication.

Risk assessment: A scientifically based process consisting of the following steps:

1) **Hazard identification:** is the identification of biological, chemical, and physical agents capable of causing adverse health effects and which may be present in a particular food or group of foods.

   Table 1. Examples of biological, chemical and physical hazards

Biological hazards	Chemical hazards	Physical Hazards
• Infectious bacteria	• Naturally occurring toxins	• Metal, machine filings
• Toxin-producing organisms	• Food additives	• Glass, Sting
• Moulds	• Pesticide residues	• Jewellery
• Parasites	• Veterinary drug residues	• Stones
• Viruses	• Allergens	• Bone chips
• Prions		• Animal bite, Kick
• Biological waste		• Horning, Scratches

2) **Hazard characterization:** is the qualitative and/or quantitative evaluation of the nature of the adverse health effects associated with biological, chemical and physical agents which may be present in food. For chemical agents, a dose-response assessment should be performed. For biological or physical agents, a dose-response assessment should be performed if the data are obtainable.
3) **Exposure assessment:** is the qualitative and/or quantitative evaluation of the likely intake of biological, chemical, and physical agents via food as well as exposures from other sources if relevant.
4) **Risk characterization:** is the qualitative and/or quantitative estimation, including attendant uncertainties, of the probability of occurrence and severity of known or potential adverse health effects in a given population based on hazard identification, hazard characterization and exposure assessment.

Risk management: The process, distinct from risk assessment, of weighing policy alternatives in consultation with all interested parties, considering risk assessment and other factors relevant for the health protection of consumers and for the promotion of fair trade practices, and, if needed, selecting appropriate prevention and control options.

Risk communication: The interactive exchange of information and opinions throughout the risk analysis process concerning risk, risk-related factors and risk perceptions, among risk assessors, risk managers, consumers, industry, the academic community and other interested parties, including the explanation of risk assessment findings and the basis of risk management decisions.

Prevention and Control of Risks/Hazards

Understanding the hazards that contribute to foodborne illness and injury is important to determine the necessary steps to prevent, reduce to an acceptable level, or eliminate altogether hazards before food reaches the consumer.

Biological Hazard Prevention

The best way to prevent biological hazards from affecting customers is to implement healthy processing and storage strategies. Kill steps used prior to packaging is necessary, such as cooking thoroughly or pasteurization of milk and juices. Use of packaging technologies during processing like vacuum sealing hinders bacterial growth. Proper temperature_management for storage can dramatically reduce microbe growth. Finally, effective sanitation practices throughout the distribution chain will reduce cross-contamination of food products. Sound, transparent, science-based import/export regulations. Up-to-date active disease surveillance and information systems. Efficiently functioning veterinary services. Alert field veterinarians, public health officials able to detect food-borne illnesses. Fully participating and cooperating animal industries.

Chemical Hazards Prevention

Proper cleaning procedures and sanitation requirements are the best methods of prevention. Training employees to follow strict guidelines is essential in preventing a chemical hazard. Additionally, limiting the use of chemicals to those generally

recognized as safe (GRAS), and ensuring that chemicals are stored in designated areas separated from food products.

Physical Hazards Prevention

Prevention of physical hazards focus primarily on thorough inspection of food, and strict adherence to food safety regulations, such as Hazard Analysis Critical Control Point (HACCP). Organizations can also take proactive steps in eliminating the potential of a physical hazard. Light bulbs, for instance, can be manufactured using different materials. Acrylic is both lighter and stronger than glass, and tends to shatter into larger, blunter fragments than glass.

Regulations and Laws

Regulatory bodies including the Food and Drug Administration (FDA) and the Ethiopian Ministry of Agriculture should have implement laws that help minimize food safety risk and ensure safer food safety practices. In doing so, food safety practices have become significantly more robust and effective.

Reporting Risks in the Work Place

- Examining the Critical Success
- Factors and Risks
- Profiling the Audience
- Cost-benefit Analysis of Disclosure
- Selecting the Report Content
- Designing the Report Format
- Placement,
- Distribution, and Communication

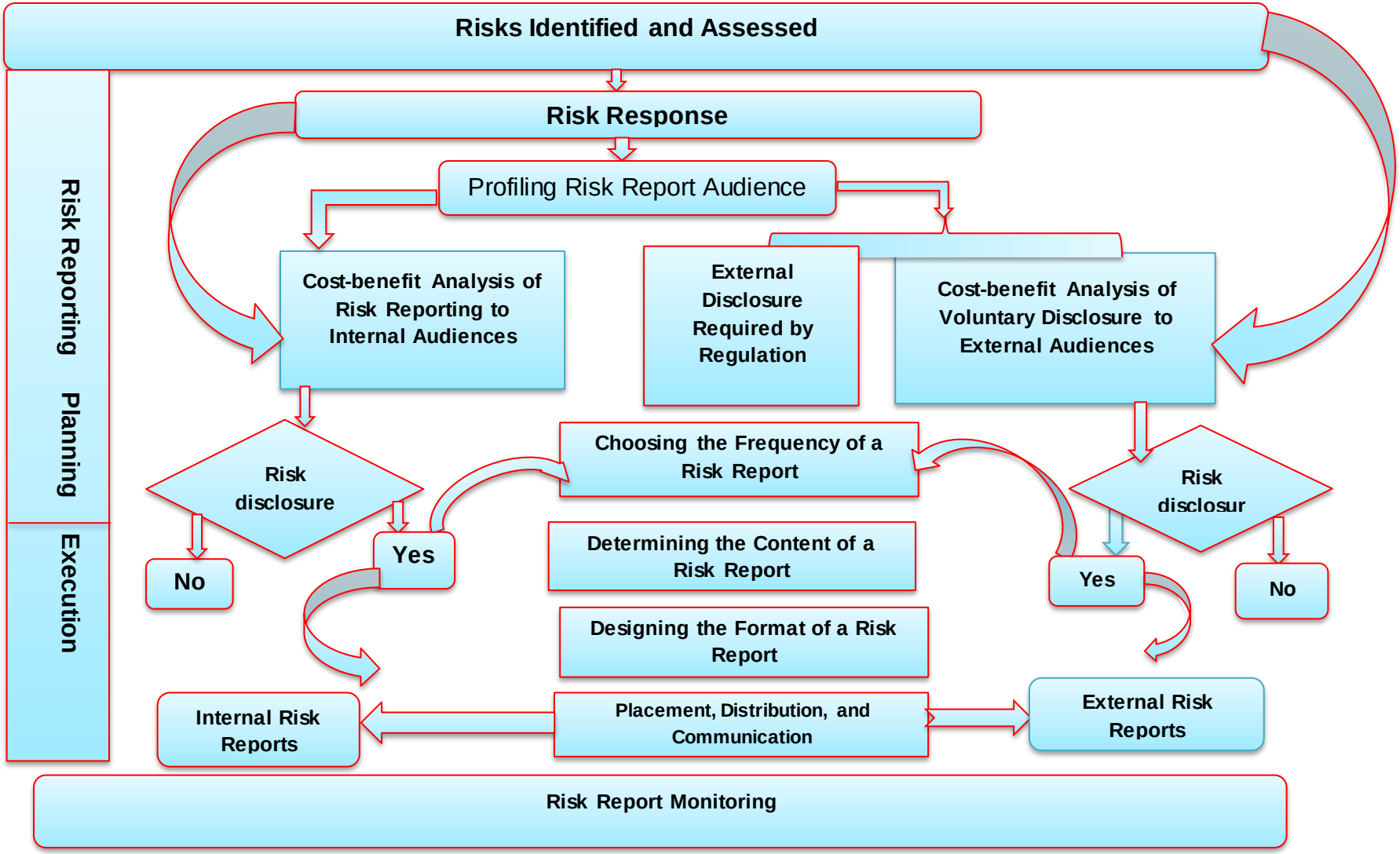

Figure 3. Risk reporting procedures in the work place

Self-Check 1 – Written Test

Name_____ **ID**_____ **Date**_____

Directions: Answer all the questions listed below 3 point each. Examples may be necessary to aid some explanations/answers.

Test I. Write true if the statement is correct/False if it is incorrect for the following questions.

1. A food hazard is defined as anything that could contaminate food and cause illness or injury.
2. Food hygiene promote understanding of how rules and regulations on food hygiene are developed and applied.

Test III. Choose the best answer for the following questions.

1. All conditions and measures necessary to ensure the safety and suitability of food at all stages of the food chain.

A. Food hygiene B. Hazard C. Food Hazard D. HACCP

2. _____is the qualitative and/or quantitative evaluation of the nature of the adverse health effects associated with biological, chemical and physical agents.

A. Hazard identification B. Exposure assessment C. Risk assessment D. All

Test II. Short Answer Questions

1. What is risk analysis
2. Discuss methods of hazard prevention.

Note: Satisfactory rating - 9 points Unsatisfactory - below 9 points

You can ask your teacher for the copy of correct answers

Information 2 - Using, Maintaining And Storing Personal Protective Equipment

1.1. Using Personal Protective equipment

The use of animals in research comes with the innate risk of accidental exposure of personnel to various hazards. Animals produce allergens from body secretions and products including dander, urine, and saliva. Chemicals like chlorine-based solutions and quaternary ammonium compounds are commonly used for environmental sanitation and disinfection. Others, like bromodeoxyuridine and tricaine methanesulfonate, and radioactive substances, such as bioimaging tracers, are used for animal experimentation. Biohazards include zoonotic agents can also affect humans while working with animals. Personnel exposure to high noise levels can occur during the care of certain animal species or when using noise-generating equipment, such as cage and rack washers. Responding to an emergency animal disease outbreak can present many risks to human health, the environment and other animals. When it is not feasible to render the working environment completely safe by containing, reducing or eliminating a potentially hazardous agent, it is necessary to protect the responder by using PPE.

PPE has two important purposes:

- Protect the responder from potentially harmful hazards
- Prevent the spread of disease agents between animals or locations

The proper selection and use of PPE serves as a biosecurity tool to help isolate a pathogen, protecting the responder, the animals, and the public. PPE must be used, decontaminated, and disposed of properly to serve these purposes. These purposes must be taken into consideration when selecting PPE for a disease emergency.

Eye and Face Protection

Eye/face protection should be worn in accordance with the health and safety plan to prevent materials such as manure, dust, mud, and contaminated biological tissue from entering the eyes, nose, and mouth. Types of eye/face protection include safety glasses, goggles, or full face shields which may reduce exposure from aerosols, dust, and manual contact.

- Goggles protect a responder's eyes from fluids splashed during cleaning and disinfection activities
- Face shields provide greater protection when conducting field autopsies, overseeing composting operations, collecting tissue samples, and during cleaning and disinfection, if fluids are caustic or irritating to the skin
- Note, neither face shields nor goggles provide eye protection from flying particles.

Figure 4. Goggles and Face Shield

Respiratory Protection A respirator is a personal protective device that is worn on the face, covers at least the nose and mouth, and is used to reduce the wearer's risk of inhaling hazardous airborne particles (including dust and infectious agents), gases, or vapors. Types of respiratory protection range from simple dust masks to powered air-purifying respirators or selfcontained breathing apparatuses. A self-contained breathing apparatus supplies clean, non-contaminated air through its own air supply for use in high-risk environments.

- Respirators either purify the air or supply fresh air
- Medical clearance, involving a medical evaluation, is required before a respirator can be used
- Fit testing is required for those respirators that form a tight seal against the face
- OSHA requires employers to have a written respiratory protection program
- A job hazard analysis will determine specifically which type of respiratory protection personnel must use

Respiratory Protection

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Figure 5. Examples of Face Masks

Air Purifying Respirators

An air-purifying respirator removes contaminants from ambient air prior to inhalation, using filters and/or cartridges. Three types are described below:

- Particulate filtering face piece respirators sometimes referred to as disposablerespirators because the entire respirator is discarded when it becomes unsuitablefor further use
- Elastomeric respirators sometimes referred to as reusable respirators becausethe face piece is cleaned and reused but the filter and/or cartridges are discardedand replaced when they become unsuitable
- Powered air-purifying respirators a battery-powered blower moves the air flowthrough the filters

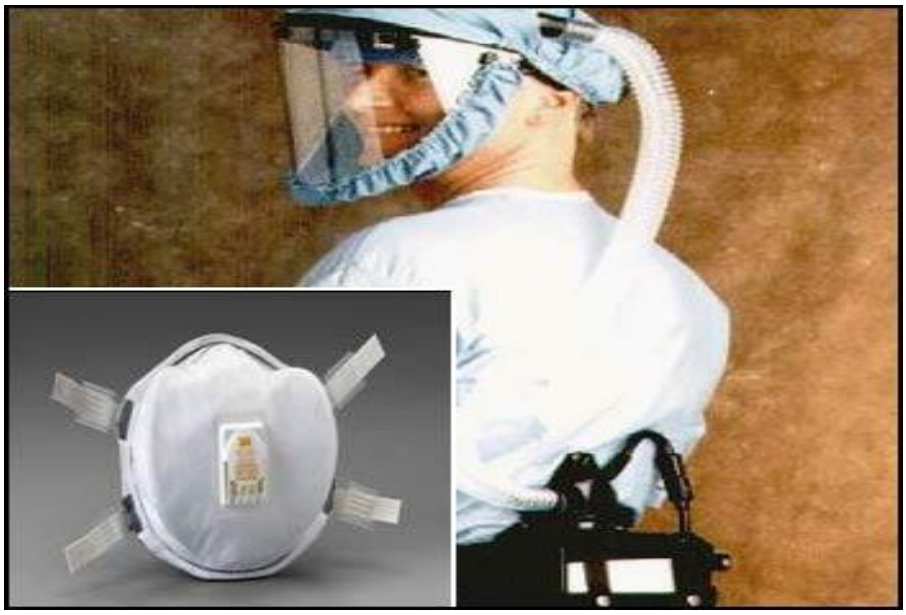

Figure 6. Air Purifying Respirator

Dermal Protection

PPE minimizes skin exposure to protect the responder while preventing the spread of disease. Long sleeves and long pants should be worn in the field and aprons or coveralls can be worn to provide additional protection. All outerwear must be appropriately cleaned and disinfected, or properly disposed of, before leaving the contaminated area.

- **Coveralls:** A protective outer layer of clothing that is worn over appropriate undergarments as an initial form of dermal protection. Clean, washable, andreusable long-sleeved one-piece cloth coveralls are most commonly used buthigher risk situations may require a less permeable, disposable, long-sleevedone-piece or similar coverall. One of the more protective materials maybe needed when there is a splash hazard, particularly of injurious or corrosiveliquids.
- **Apron:** A full-length, waterproof, cut-resistant garment worn in front of one'sclothes and tied at the back. Often worn during field autopsies or when collectingand cutting tissues that may be contaminated with a disease agent of highzoonotic risk.

Hand Protection

Hand protection includes disposable gloves or gloves that can be disinfected. Standard disposable latex gloves are recommended for clinical use in the field; however, the SO should be consulted for specific guidance. Other types may be substituted under certain conditions and for those with latex allergies:

- **Nitrile gloves:** Protect against solvents, chemicals, fats, and petroleum productswhile providing excellent resistance to cuts, snags, punctures, and abrasions
- **Polyvinyl chloride (PVC) gloves:** Resist degradation, penetration, andpermeation to chemical agents. PVC gloves can be worn as outerwear protectionin more hazardous environments, including cleaning and disinfection activities.
- **Butyl rubber gloves:** Protect against chemicals such as acids, ketones, esters,bases, alcohols, amines, and amides
- **Neoprene gloves:** Provide resistance to heat, punctures, chemicals, acids,solvents, and grease
- **General purpose gloves**: Useful when performing activities that do not involvecontact with contaminated material

Figure 7. Types of Gloves

Head and Hearing Protection

Head and hearing protection is recommended when working around heavy machinery, equipment, supply areas, or loud noises.

Head protection may include:

- Hard hat
- Hood
- Disposable head cover/hair bonnet

Hearing protection includes:

- Ear muffs
- Disposable ear plugs
- Reusable ear plugs

Foot Protection

Foot protection for field use should include rugged impermeable boots made of rubber or waterproof plastic material with shallow treads that can be disinfected or discarded.

- High pull-on boots worn over stocking feet are preferable to overshoes or overboots
- Safety boots with steel toes and midsoles provide extra protection from puncturewounds and crushing
- Boots must fit well and be comfortable
- For operations involving avian influenza, secure coverall legs over the boots withduct tape (or similar), leaving enough excess fabric around the knees to allow fullmobility

Figure 8. Foot Protection

Equipment maintaining and storing

Equipment should be located so that it: permits adequate maintenance and cleaning; functions in accordance with its intended use; and facilitates good hygiene practices, including monitoring. Following cleaning and disinfection return all reusable PPE to storage

- Dirty or unmaintained equipment and facilities promote food hazards, pests, and other agents likely to contaminate food.
- Carry out repairs early.
- Stack stored produce in pest proof packs and containers above the ground.
- Storage should provide 50 cm between product and the wall to allow cleaning and pest control
- Store refuse in covered, pest-proof containers.
- Do not allow waste, food particles or water to accumulate.
- These would attract and harbour pests.

Equipment Disposal, Cleaning and Disinfection

Following the handling of potentially infected materials, it is important that all PPE be properly disposed or cleaned and disinfected. Important actions include:

- Removing and placing all disposable equipment in designated containers.Disposable PPE should be removed without touching contaminated outersurfaces.
- Remove gloves last. Pull them inside out and dispose in proper containers.
- Cleaning and disinfecting reusable equipment and PPE with authorized cleaningand disinfecting agents
    - ✓ Cleaning is the physical removal of organic material (i.e., manure, blood,feed, and animal tissue). It is important to remove these organic materialsbefore the disinfection process. Residual organic material can harbordisease agents and reduce disinfectant effectiveness.
    - ✓ Disinfection is the killing of disease agents by direct exposure to chemicalor physical agents
    - ✓ If decontamination trailers are used, clearly marked containers should be provided for contaminated reusable clothing as well as for contaminated disposable items.

Protocols for safe work practices include:

- Risk identification and risk minimization;
- The handling, use, storage, transport and disposal of chemicals; and
- The handling and disposal of biological wastes.
- Handling of chemicals and medicines in the organization requires extra care

Self-Check 2 – Written Test

Name_____ **ID**_____ **Date**_____

Directions: Answer all the questions listed below 3 point each. Examples may be necessary to aid some explanations/answers.

Test I. Write true if the statement is correct/False if it is incorrect for the following questions.

1. Goggles protect a responder's eyes from fluids splashed during cleaning and disinfection activities.
2. Respirators either purify the air or supply fresh air.

Test II. Choose the best answer for the following questions.

1. A full-length, waterproof, cut-resistant garment worn in front of one's clothes and tied at the back. A. Head protection B. Apron C. Hood D. Coveralls

Test III. Short Answer Questions

1. Write the importance of PPE.
2. Describe the protocols for safe work practices.

Test IV. Fill in the blank space with appropriate word phrase.

1. _____protective outer layer of clothing that is worn over appropriate undergarments as an initial form of dermal protection.

Note: Satisfactory rating - 3 points **Unsatisfactory - below 3 points**

You can ask your teacher for copy of correct answers

Information 3 - Implementing Safe Work Practices and OHS Procedures

1.1. Introduction

The occupational health and safety program is an integral component of a comprehensive animal care and use program. It is important to mitigate the risk of exposures of animal care and research personnel to allergens and physical, chemical, radiologic, and biologic hazards during the conduct of various tasks. This need is especially true in infectious disease and biocontainment research.

All employees have the right to work in an environment that is free of recognized hazards that may cause death or serious physical harm. The role of the Occupational Safety section is to establish policies, practices and procedures that, when followed, reduce the risk to the working environment of injury while performing their job duties. Occupational health and safety procedure has implemented policies that reflect the current standard of care for safe job performance. Occupational safety staff monitors compliance through periodic job site and maintenance shop inspections. Staff members are available to consult on any occupational safety issue and regular training classes are provided to make sure all stakeholders have the latest information relevant to performing their jobs in a safe manner.

1.2. Implementing Safe Work Practices And OHS Procedures

The recommended practices present a step-by-step approach to implementing occupational safety and health program, built around **seven core elements** that make up a successful program. The main goal of occupational safety and health programs is to prevent workplace injuries, illnesses, and deaths, as well as the suffering and financial hardship these events can cause for workers, their families, and employers. The recommended practices use a proactive approach to managing workplace safety and health. Traditional approaches are often reactive –that is, problems are addressed only after a worker is injured or becomes sick, a new standard or regulation is published, or an outside inspection finds a problem that must be fixed. These

recommended practices recognize that finding and fixing hazards before they cause injury or illness is a far more effective approach.

To ensure safe working environment the workers should:

- Develop and implement a comprehensive written workplace-specific safety and health program.
- Review and update the written safety and health program periodically.
- Document and maintain staff records of training, immunizations, and work-related injuries and illnesses.
- Comply with Federal and State occupational hazard laws.
- Comply with relevant Federal, State, and local laws such as proper veterinary waste management and disposal.
- Inform all workers and volunteers about potential workplace hazards.
- Promote safe work habits including best infection control practices.
- Have a medical surveillance system in place to record and report workplace-related injuries and illnesses.
- Ensure that equipment is maintained and operated safely.
- Wear protective equipment while working (inspecting) with animal origin food

Self-Check 3 – Written Test

Name_____ **ID**_____ **Date**_____

Directions: Answer all the questions listed below 3 point each. Examples may be necessary to aid some explanations/answers.

Test I. Write true if the statement is correct/False if it is incorrect for the following questions.

1. Occupational health and safety program is an integral component of a comprehensive animal care and use program
2. Review and update of the written safety and health program is not important for occupational safety.
3. Promote safe work habits is highly important for occupational health and safety program.

Test I Short Answer Questions

1. What is the purpose of occupational and safety programme?
2. To ensure safe working environment what points should be considered?

Note: Satisfactory rating - 5 points **Unsatisfactory - below 5 points**

You can ask your teacher for copy of correct answers

Information 4 - Disposing Wastes

4.1. Introduction

Garbage accumulation has never been much of concern in the past, but due to globalization and industralization, there is a need for a more efficient waste disposal method. Following are some of the methods that are used today.

4.2. Types of waste disposal methods

1) Landfill

In this process, the waste that cannot be reused or recycled are separeted out and spread as a thin layer in low – lying areas across a city/working environment. A layer of soil is added after each layer of garbage. Hwever, once this process is complete, the area is declared unfit for working.

2) Icinaration

Incineration is the process of controlled combustion of garbage to reduce it to incumbustible 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 environmnt. This process reduces th volume of waste by 90% 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.

3) 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 materials and reduces airspace need, thus making transportation and positioning easy.

4) Biogas Generation

Biodegradable waste, such as food items, animal waste or organic industrial waste from food packaging industries are sent to bio-degradable plants. In bio-degradation plants, they are converted to biogas by degradation with the help of acteria, fungi or other microbes. Here, the organic matter serves as food for the microorganism. The degradation can happen aerobically or anaerobiclly. Biogas is generated as a result of this process which is used as feul and the residue is used as manure.

5) Composting

All organic materials decompose with time. Food scraps, yard waste, etc make up for one of the major organic wastes we throw every day. The process of composting starts with these organic wastes being buried under layers of soil and then are left to decay under the action of mcroorganisms such as bacteria and fungi. 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.

6) Vermicomposting

Vermicomposting is the procsee of using worms for the degradtion of organic matter into nutrient rich manure. Worms consume and digest the orgnic matter. The by-products of digestion which are ecreted out by the worms make the soil nutrient rich, thus enhancing the growth of bacteria and fungi. It also far more effective than traditional composting.

Disposal of animal by-products and other wastes

Food wastes and by-products and other waste materials can be a significant source of microbiological and physical contamination of food that is intended for human consumption. Waste products must not re-enter the food chain. Waste material is also a potential source of food for pts, which may give rise to further microbiological contamination. Such hazards could cause illness or injury to consumers and so must be prevented or minimized. Environmental contamination is a hazard which other

legislation seeks to control. The disposal of animal origin food which are unfit for human consumption, including specific risk materials, must be carry out according to specific legislation and category of products to ensure animal and human health. Food waste, non-edible by-products and other refuse are to be removed from rooms where food is present as quickly as possible, so as avoid their accumulation.

7. Rendering

Rendering is essentially a cooking process that results in sterilization of raw materials of animal origin such that parts of carcasses may be utilized safely for subsequent commercial purposes. There are a number of variations of the rendering process, broadly divided into batch processes. In general, the raw materials are finely chopped and then passed into a steam-heated chamber and subjected to temperature ranging from 100^0C to 150^0C for 10-60 minutes (this does not include the time taken to bring the material to the peak temperature or the subsequent cooling period time).

In general dispose animal origin food that are unfit for human consumption by the following methods

- Incinerating or co-incinerating without processing or with prior processing, when resulting material has to be marked with glyceroltriheptanoate (GTH)
- Sending them to authorized landfill after processing by pressure sterilization
- Making them into organic fertilizers/ soil improvers, after processing
- Composting or anaerobic digestion after processing by pressure sterilization and marking with GTH (milk, milk products, eggs, egg products, digestive tract content, manure do not need processing, providing no risk of spreading serious transmissible disease)
- Applying them to land, in the case of manure, digestive tract content, milk, milk products and colostrum, this can be done without processing
- Using them in composting or anaerobic digestion, if they are materials coming from aquatic animals ensiled
- Using them as fuel for combustion

- Using them for manufacture of certain cosmetic products, medical devices and safe industrial or technical uses

Emergencies encounter during handling/dealing with animals

1. Animal escapes

Animal Escape: any event when a zoo collection animal is no longer securely enclosed by the primary containment barriers for its exhibit or holding facility. The employee reporting the escape should remain calm, speak deliberately and clearly and provide the following information to the best of their knowledge:

Reporting an animal escape

1) Name of reporting employee
2) If reporting via telephone give the location and phone extension number you are reporting from so you can be located/contacted again as needed.
3) The species of escaped animal. (If the exact species is not known use closest group term for example bear, large cat, antelope, etc.)
4) The number of escaped animals observed
5) Exact location of animal(s)
6) Direction of animal(s) movement
7) Condition and behavior of animal (injured, panicked, running, etc)
8) Any humans injured by the escaped animal
9) Animal description (sex, adult/young, specific ID) if known

2. Electrocution

Electrocution means accidental injuries or death caused by electric shock passing through the body of the animal. It can happen due to lightning, high voltage electric current from fallen transmission wires and accidental chewing of live electric wires. An animal may come directly in contact with such wires or indirectly through electrification of ponds by fallen electric transmission wires. The clinical signs of electric shock depend upon the amount of voltage to which the animal is exposed. In most cases of electrocution by lightning stroke, the animal dies on the spot and falls without any

struggle. Occasionally, affected animal becomes unconscious but may recover in a few minutes to several hours. Other signs of electrocution are depression, blindness, etc., which may persist for few days or weeks. Electrocution due to lightning can be detected on the basis of history of lightning, single mark of injury on the dead body of the animal and damage to the immediate environment like burning of adjoining ground area.

Treatment is carried out in mildly affected animals and on the basis of clinical signs observed in them. Affected animals are kept in quiet and calm area with minimum disturbances. Adequate water is offered to the affected animals. Skin wounds are treated with application of antibiotic creams.

3. Chemical spills

Chemical spill: The inadvertent release of a liquid chemical regarded as hazardous to human health, irrespective of the volume or place of release indoors or environmental which, in a workplace, is identified with hazardous materials labels. In the event of a chemical spill, the individual(s) who caused the spill is responsible for prompt and proper clean-up. It is also their responsibility to have spill control and personal protective equipment appropriate for the chemicals being handled readily available.

A spill is defined as an uncontrolled release of a chemical. Spills can be categorized into two types:

a. Major spills
b. Minor spills

Major spills meet these criteria:

- There is fire or potential for fire or explosion.
- The spill poses an immediate danger to life or health.
- There are injuries requiring medical attention.
- Do not know the properties or hazards of the spilled material

Major spills require an external emergency response

Minor spills are spills that do not meet the criteria of a major spill and can normally be dealt with by office personnel.

Procedure for chemical spills management

1) Notify your safety representative as well as all people in the laboratory of the chemical spill immediately.
2) Contain spill as best as possible using absorbent paper/s and or appropriate chemicals. If liquid has spilled from a container, return the container to the upright position to prevent further spread of the liquid.
3) Close all drains to prevent the spill from reaching the environment.
4) Switch off all electrical equipment in the vicinity of the spill.
5) Cordon off the area and control access of unnecessary persons.
6) Assist any person that has been exposed to chemical contamination.
7) First aid kit is available in the laboratory.
8) Spill kit is available at the Emergency shower.
9) Trained first aid workers are available in the department.
10) Technical staff will report spill to supervisor/ officer if help is needed.
11) Clean up spill

4) Anaphylactic shock

Anaphylaxis is defined as the acute onset of a hypersensitivity reaction causing the release of mediators from mast cells and basophils. Anaphylaxis may be a life-threatening condition that can involve one or more organ systems. Often, a specific cause for anaphylaxis is not known. Anaphylaxis may be brought on by anaphylactic or anaphylactoid reactions; treatment is the same regardless of reaction type. Anaphylactic shock is extremely serious. It can block airways and prevent from breathing. It can also stop heart functioning. This is due to the decrease in blood pressure that prevents the heart from receiving enough oxygen Veterinarians are seeing an increasing number of anaphylaxis patients because of the range of substances patients are exposed to, such as vaccines, new medications, and those from outdoor physical exposures. However, anaphylaxis is often misdiagnosed because definitive criteria to distinguish anaphylaxis from an allergic reaction are lacking.

Treatment of anaphylaxis is entirely based on clinical signs but should follow the guidelines for fundamental life support. Treatment should be initiated quickly and take

priority over diagnostics because of the likelihood of rapid progression of clinical signsand increasing possibility of death. As with all life support treatment, rapid triage assessment, including airway, breathing, circulation, and mental status, is paramount. Delays in treatment can lead to worsening outcomes. Immunologic and no immunologic hypersensitivity responses produce identical clinical signs and are thus treated the same.

5) Poisoning

It is a condition in which the animals suffer from a toxic substance or venom of an animal. Poisoning causes deleterious effects on the animals. Animals might swallow the poison, inhale it or absorb it through the skin. Even overdose of medicines given to animals may prove poisonous. Usually farm animals suffer from poisoning by eating poisonous plants, accidentally ingesting urea, rodenticides, pesticides, etc. Poisoning causes minor irritations like mild abdominal pain, dullness and depression in the animals. In severe cases, the animal refuses to take feed and shows sudden onset of nervous signs like muscular trembling, convulsions and excessive frothing from the mouth. The animal may ultimately die if not treated in time.

General principles of first aid in case of poisoning include immediate attention to theaffected animal. If the route of poisoning is through ingestion then purgatives are given to the affected animals. Under field conditions, the poisoned animal is fed with crushed coal because charcoal acts as an antidote for poisoning. If the animal is suspected of poisoning through skin, then the skin of the animal is washed thoroughly with soap and water. Apart from these, expert veterinary care is necessary.

Self-Check 4 – Written Test

Name_____ **ID**_____ **Date**_____

Directions: Answer all the questions listed below 3 point each. Examples may be necessary to aid some explanations/answers.

Test I. Write true if the statement is correct/False if it is incorrect for the following questions (2 point each).

1. Incineration is the process of controlled combustion of garbage to reduce it to incombustible matter.
2. The biogas process prevents the oxidation of materials and reduces airspace need, thus making transportation and positioning easy.
3. Poisoning causes deleterious effects on the animals

Test II. Choose the best answer for the following questions (2 point each).

1. _____is the process of using worms for the degradation of organic matter into nutrient rich manure. A. Vermicomposting . Composting C. Incineration D. Landfill
2. Which one of the following is an accidental injuries or death caused by electric shock passing through the body of the animal? A. Electrocution B. Poisoning C. Chemical spill D. Snake bite

Test III Short Answer Questions

1. **Briefly define the following terns (5 point).**
   a) Composting
   b) Vermicomposting

Note: Satisfactory rating – 7.5 points Unsatisfactory - below 7.5 points

You can ask your teacher for copy of correct answers

Operation Sheet: 1. Procedure for Chemical spills Reporting

Objective: Procedure for Chemical spills Reporting

Materials: (Paper, Pen, Tel. phone.)

Procedure:

1) Notify your safety representative as well as all people in the laboratory of the chemical spill immediately.
2) Contain spill as best as possible using absorbent paper/s and or appropriate chemicals. If liquid has spilled from a container, return the container to the upright position to prevent further spread of the liquid.
3) Close all drains to prevent the spill from reaching the environment.
4) Switch off all electrical equipment in the vicinity of the spill.
5) Cordon off the area and control access of unnecessary persons.
6) Assist any person that has been exposed to chemical contamination.
7) First aid kit is available in the laboratory.
8) Spill kit is available at the Emergency shower.
9) Trained first aid workers are available in the department.
10) Technical staff will report spill to supervisor/ officer if help is needed.

Operation Sheet: 2. Reporting an animal escape

Objective: Reporting an animal escape

Materials: (Paper, pen, ID No, History of animal, Tel. phone)

Procedure:

1) Name of reporting employee
2) If reporting via telephone give the location and phone extension number you are reporting from so you can be located/contacted again as needed.
3) The species of escaped animal. (If the exact species is not known use closest group term for example bear, large cat, antelope, etc.)
4) The number of escaped animals observed
5) Exact location of animal(s)
6) Direction of animal(s) movement
7) Condition and behavior of animal (injured, panicked, running)
8) Any humans injured by the escaped animal
9) Animal description (sex, adult/young, specific ID) if known

LAP TEST

Name_____ **ID**_____ **Date** _____

Time started: _____ **Time finished:** _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 1 hour. The project is expected from each student to do it.

During your work: You can ask all the necessary tools and equipment

Lap Test Title: Procedure for Chemical spills Reporting

Reporting an animal escape

Task1. Perform chemeical spill reporting/management

Task 2. Perform animal escape reporting

LG 94	LO 2. Assist in sampling of milk, egg and honey

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Identifying, maintaining and using sampling materials and equipment
- Identifying, maintaining and using PPE
- Collecting sample
- Following sampling procedures
- Asking advices
- Recording or reporting Information.

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Identifying maintain and using sampling materials and equipment
- Identify, maintain and using PPE
- Collect sample of milk, egg and honey
- Follow sampling procedures
- Ask advices
- Record or report Information

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the "Information Sheets". Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the "Self-checks" which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to "Operation sheets
7. Perform "the Learning activity performance test" which is placed following "Operation sheets" ,
8. If your performance is satisfactory proceed to the next learning guide,
9. If your performance is unsatisfactory, see your trainer for further instructions or go back to "Operation sheets".

Information 1 - Identifying, Maintaining and Using Sampling Materials and Equipment

1.1. Introduction

Milk is nature's most complete food - practically the only foodstuff that contains all the different substances known to be essential for human nutrition. However, it is quite a complex and perishable substance. Milk needs to be carefully checked and tested at each stage of the dairy food chain to ensure that consumers get milk that is safe and wholesome.

1.2. Milk sampling equipment

The basic kit needed is: an agitator, a dipper, sample containers and a sterilizer. It is important that the material of the equipment used does not affect the test results. Sampling equipment should preferably be made of stainless steel. Alternatively, other suitable material of adequate strength can be used, for example adequately galvanized iron. Solder should be capable of withstanding a sterilizing temperature of 180 °C. All surfaces should be smooth, free from cracks and all corners rounded.

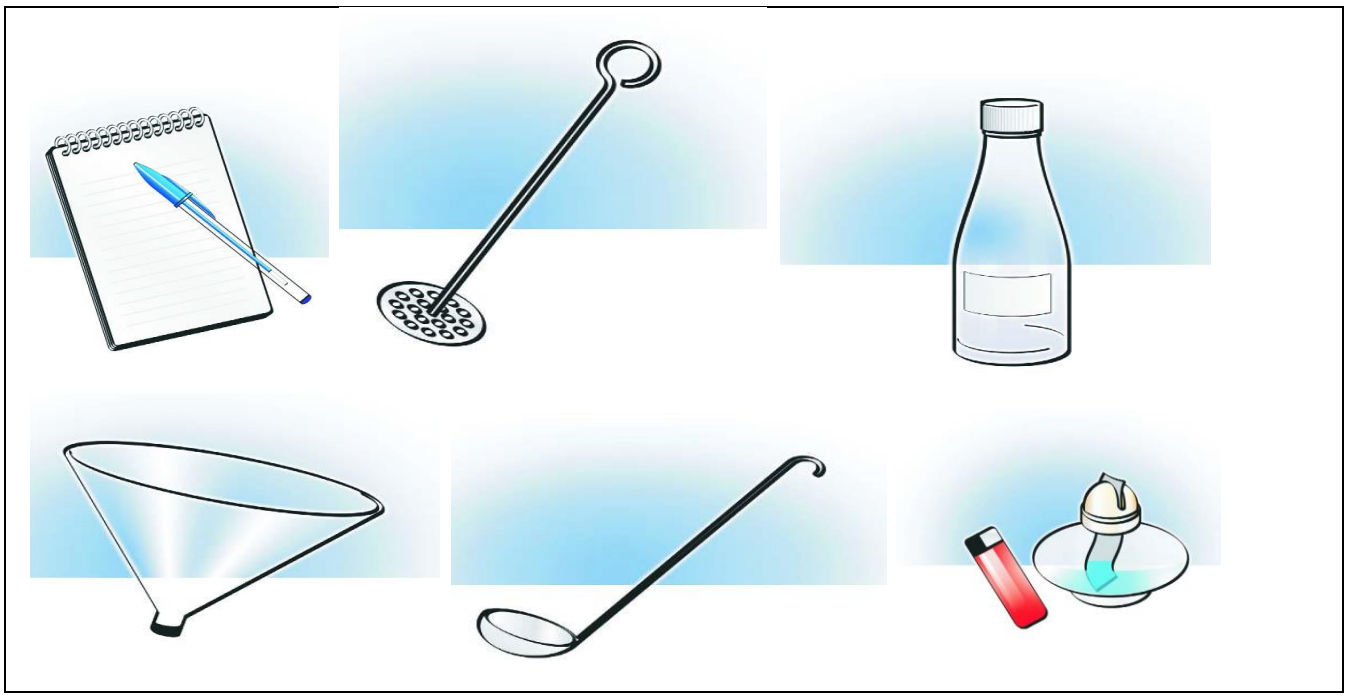

Figure 9. Milk sampling materials (Pen and note book, plunger, bottle, funnel, Dipper and sprint flame and lighter)

All dairy utensils such as buckets, milking cans and filters should be thoroughly cleaned immediately after use. Any milk residues on the equipment will allow microorganisms to grow rapidly. Also ancillary equipment, including foremilk cups and udder cloths, must be cleaned and disinfected effectively.

1.3. Honey Sampling Equipments

Pure honey is a source of many benefits. In addition to testing delicious, it has a host of health benefits that other sweet additives do not possess. Acute and sub-lethal poisoning from pesticides can be a problem for beekeepers. Honey bees come into contact with pesticides outside the colony while foraging for nectar and pollen, and inside the colony while feeding, contacting beekeeper applied miticides, or contaminated comb wax. Honey sample can be collected by using different methods

1) By pipetting honey cell using micropipette/dropper
2) By extracting honey using a honey extractor
3) By squeezing honey from combs

Apparatus such as

- Filter for general purpose
- 100ml Beaker
- Quartz cell
- Volumetric flask
- Test tubes
- Screw cap vials
- Pipette
- Burette
- Automatic titrator
- Nitrile gloves
- Permanent marker
- Sample vial
- 10 wooden sampling sticks
- Aluminum foil
- 250ml beaker
- PH meter

1.4. Egg Sampling Equipments

Egg sampling equipment is used to collect egg sample for judging its quality. It is easy task with a little training. Both internal and external egg quality can be assessed using a couple of basic tools such as:

Sampling spoon (curved, long handle)

Self-Check 1 – Written Test

Name_____ **ID**_____ **Date**_____

Directions: Answer all the questions listed below 3 point each. Examples may be necessary to aid some explanations/answers.

Test I. Write true if the statement is correct/False if it is incorrect for the following questions.

1. Pure honey is a source of many benefits.
2. Honey bees come into contact with pesticides outside the colony while foraging for nectar and pollen.
3. Egg sampling equipment is used to collect egg sample for judging its quality

Test II. Choose the best answer for the following questions.

1. Which one of the following is milk sampling equipment?

   A.Pen and note book

   B. Plunger, bottle, funnel,

   C.Dipper and sprint flame and lighter D. All of the above

Test III. Short Answer Questions

1. Describe equipment used for assessing quality of egg.
2. List different type of honey sampling methods.

Note: Satisfactory rating - 3 points **Unsatisfactory - below 3 points**

You can ask your teacher for copy of correct answers

Information 2 - Identify, Maintain and using Personal Protective equipment

2.1. Introduction

Animal hazards may include injuries due to sudden animal movements, bites and scratches, and zoonosis (diseases spread from animals to humans). Personal protective equipment (PPE) includes devices such as safety glasses, gloves, protective clothing, hearing protection, respiratory protection and safety shoes. PPE is typically worn to establish a protective barrier between the wearer and a potentially injurious hazard in the workplace. PPE is generally considered to be the last line of defense for the mitigation of risk and the protection of workers from potential and actual hazards. Where feasible, the following hierarchy should be used when implementing workplace controls:

Examples of personal protective equipments

- Glove
- Eye gogle
- Face mask
- Boots
- Overall
- Lab coat
- Long sleeve shirt
- Long trousers
- Heavy shoes
- Long gloves
- Apiculture hat

Long sleeve shirt: A long sleeve shirt made of denim or flannel is ideal. The thicker material will blunt any stings should your bees get excited.

Long trousers: Likewise, long trousers made of denim are your best bet in the absence of a bee suit. Use rope or tape to secure the cuffs so that bees cannot get in.

Heavy shoes: Choose footwear that completely covers your toes, feet, and ankles. A good pair of boots should do the trick.

Long gloves: A pair of long gloves to go up above the wrists will protect your hands and lower arms. You can use rope or tape to secure them the same way you do the cuffs of your trousers.

Apiculture hat: Finally, an apiculture that protects your head and face. This is probably the most critical piece of clothing given that agitated bees will go for your head first. You can get a good apiculture hat anywhere you buy beekeeping supplies.

Self-Check 2 – Written Test

Name_____ **ID**_____ **Date**_____

Directions: Answer all the questions listed below 3 point each. Examples may be necessary to aid some explanations/answers.

Test I. Write true if the statement is correct/False if it is incorrect for the following questions (5 point).

1. Animal hazards may include injuries due to sudden animal movements and zoonosis.

Test II. Short Answer Questions (5 point)

1. List PPE that are used during harvesting bee honey.

Note: Satisfactory rating – 5 points **Unsatisfactory - below 5 points**

You can ask your teacher for copy of correct answers

Information 3 - Collecting Sample of Milk, Honey and Eggs

3.1. Introduction

Important factors that determine the design and implementation of a sampling programme involve shipment size, ingredient variability, laboratory accuracy, and cost of the essay and value of the ingredient. Therefore, when defining the sampling procedures one should consider the purpose of sampling, the laboratory analysis through which samples will undergo and the characteristic of the ingredients and finished products. Sampling protocols should meet scientifically recognized principles and procedures. Laboratory methods should be developed and validated according to scientifically recognized principles. Sampling procedures will depend on the nature of the raw material, in process or finished product lots, conveying and sampling equipment. Prior knowledge of the product data and sampling resources allows the assignment of the appropriate sampling procedures. The use of recognized international sampling methods will ensure a standardized administrative and technical approach and will facilitate the interpretation of results of analysis related to lots or consignments of food.

3.2. Milk Sample Collection

Milk is a yellowish-white non-transparent liquid. Fresh milk has a pleasant soft and sweet taste and carries hardly any smell.

Milk samples may be collected individually from affected quarters (quarter milk samples) or combined from multiple quarters of a cow into one sample tube (composite milk samples). Composite milk samples are not recommended however, as cultures usually reveal growth of numerous different bacterial species, making it difficult, if not impossible, to determine which are mastitis pathogens and which are environmental contaminants. Isolation of contagious organisms such as Staphylococcus aureus, Streptococcus agalactiae, or Mycoplasma sp. is indication of true infection of the udder; environmental organisms such as Streptococcus spp., coliforms, Staphylococcus spp.,

(coagulase negative Staph.), Pseudomonas sp., Corynebacterium sp., yeast, and fungi may be contaminants or true infections. Unless you are only screening for contagious pathogens, composite milk samples should be avoided.

Milk samples may become contaminated with bacteria from the hands of the sample collector, the environment, and the teat skin or teat canal. It is important that proper sample collection techniques are used in order to avoid contamination of the milk sample. There is no need to test the whole quantity of milk – we can test only a small sample, to check the quality. Accurate sampling, however, is essential for a proper quality control system. Liquid milk in cans and bulk tanks should be thoroughly mixed to disperse the milk fat. Then, a sample for testing is taken from the can, using a plunger or a dipper. In the case of packed products, representative samples must be taken to make sure that the samples actually reflect the whole batch.

Agitators

Agitators (also called plungers) for mixing milk need to be large enough to produce adequate mixing. In view of the different shapes and sizes of containers, no specific design of agitator can be recommended for all purposes, but the design should be such that damage of the inner surface of the container is avoided during mixing. For mixing liquids in buckets or cans. The length can be adjusted to the depth of the can.

Dippers

A dipper of the shape and size should bbe suitable for collecting samples. The capacity of the sample containers shall be such that they are almost completely filled by the sample taken by the dipper.

Sample containers

Sample containers should adequately protect the sample and not affect the test results. Appropriate materials include glass, some metals (e.g. stainless steel) and some plastics (e.g. polypropylene). The containers should preferably not be transparent, but if they are transparent they should be stored in a dark place. Containers and closures

should be dry, clean and either sterile or suitable for sterilization by one of the methods described below. The shape and capacity of the containers depend on the particular requirements of sampling, and could be e.g. 100, 150 or 250 ml. It is desirable to avoid air space by filling the bottles to the top, leaving however sufficient space to allow for expansion of the rubber stopper. Single-service plastic containers as well as aluminium foil of adequate strength (sterile and non-sterile) and suitable plastic bags, with appropriate methods of closure, may be used.

Sterilizing of sampling equipment

Sampling equipment has to be clean and sterilization is required for microbiological testing. Disposable plastic equipment also needs to be sterile. Sterilization can be performed by one of the two following methods:

- Exposure to hot air at 170-75 °C for not less than 2 hours.
- Exposure to steam at 121 ± 1 °C for not less than 20 minutes in an autoclave.

Guide lines while collecting Milk Samples

Plastic tubes with snap-on lids work best for collecting milk samples. Whirl pack and Ziplock bags should not be used as they are easily contaminated during sample collection and also often leak during transportation.

- To avoid contamination, handle sample tubes properly to ensure sterility at all times. Make sure nothing but the sample milk comes into contact with the inside of the tubes.
- Check that sample tubes are no more than ½ full and that lids are completely closed to avoid leakage or bursting upon freezing (milk expands when frozen).
- Collect samples directly from teats. Bucket or milk meter samples carry over bacteria from previous cows.
- The best time to sample is at milking time before the cow is milked. If the sample is not collected at milking time, it should be taken at least 4 hours after the last milking.
- Label the sample tube with a permanent marker before sample collection as milk fat will cause the ink to smear.

- For composite milk samples, try to collect the same volume of milk from each quarter.
- Minimize contamination by collecting samples in a clean area, such as the parlor. Avoid areas with massive air movement where bedding and dust can cause major contamination problems.
- Make sure samples are cold or frozen until they are delivered to the lab to avoid excessive growth of bacteria, which can lead to misleading results.

Bulk Tank Milk Samples

Bulk tank milk cultures are a great way to monitor milk quality. They can determine the presence or absence of a bacterial group and identify predominant bacterial groups in bulk tank milk.

3.3. Honey Sample Collection

Honey is the natural sweet substance, produced by honeybees from the nectar of plants or from secretions of living parts of plants, or excretions of plant-sucking insects on the living parts of plants, which the bees collect, transform by combining with specific substances of their own, deposit, dehydrate, store and leave in honeycombs to ripen and mature.

Honey is gathered by honey bees from two different sources: nectar or honeydew. Nectar is the most common source of honey worldwide. Nectar is a sugar solution of varying concentration secreted by flower nectary. The sugar composition in nectar, with principal sugars being frucrose, glucose and sucrose, is typical from the plant species. Most nectar consists mainly of fructose and glucose. Its sugar concentration actualy depends on the different climatic factors such as temperature, soil, humidity and season. Honey is carbohydrate rich syrup. It is not only a popular sweetener but also a folk medicine used since ancient time.

The Uses Of Honey

For bees: Bees produce honey to act as a food store for the colony for periods when there are no flowers, or the climate is adverse. For example, during the winters of northern, temperate countries, few plants are flowering between October and March, and bee colonies need honey stores to survive throughout this flowering dearth period, and when it may be too cold to leave the nest. In tropical countries, bees need to survive through seasons when there are no flowers, periods of drought, or when bees are not able to forage because of rain or other adverse weather.

As food for humans: Honey is a useful source of high-carbohydrate food, and usually contains a rich diversity of minor constituents (minerals, proteins, vitamins and others), adding nutritional variety to human diets.

As a medicine or tonic

In many countries, honey is regarded more as a medicine or special tonic, rather than as an every-day food. Honey does have medicinal properties that are acknowledged increasingly by modern medicine.

"**Honey adulteration**" refers to the act of adding some foreign substances into pure honey. This incident had existed since hundreds of years ago. Several laboratory techniques had been developed and adapted by Honey Research Group. Honey samples can be collected from honey by using pipetted from honey cells using a micropipette/dropper, it can also extracted honey using a honey extractor, and squeezed honey from combs. The honey samples are identified as pure honey if they meet all the characteristics of pure honey.

Egg Sample Collection

Eggs and egg products are important commodities in international trade. Eggs and egg products are subdivided into (l) shell eggs and (2) liquid, frozen, and dried eggs. Mention is also made of foods containing eggs. The whole egg in the shell is self-protective unless abused by excessive exposure to contamination at the laying stage and gross temperature and humidity changes during storage. Immediately after the shell is broken, by whatever means, the liquid egg is exposed to contamination from hands, equipment, and the external surface of the shell itself. The most important pathogen likely to be present in liquid, frozen, and dried eggs is Salmonella. This organism may occasionally be present within the egg at the time of laying, but much more commonly it contaminates the liquid egg from the external surface of the shell during the breaking of the shell.

There are then the dangers of

a) Eating the contaminated raw product,
b) Cross-contamination from raw or unpasteurized egg products to foods prepared in the bakery and confectionery trades or in foodservice kitchens,
c) Direct contamination when an unpasteurized dried-egg product is incorporated into blended foods, and
d) Inadequate heating of egg products (e.g., those used for infant feeding) before consumption.

Mandatory pasteurization of liquid egg should eliminate these hazards. However, any salmonellae surviving pasteurization or contaminating the product subsequently may be expected to survive freezing or drying. Thus, salmonellae remain a potential hazard in egg products, because of the opportunities for multiplication that may arise from time/temperature abuse after thawing or rehydration.

Sampling Plans

a) Shell eggs: Sampling plans are not proposed for shell eggs.
b) Liquid, frozen, and dried eggs

Self-Check 3 – Written Test

Name_____ **ID**_____ **Date**_____

Directions: Answer all the questions listed below 3 point each. Examples may be necessary to aid some explanations/answers.

Test I. Write true if the statement is correct/False if it is incorrect for the following questions.

1. Sampling protocols should meet scientifically recognized principles and procedures.
2. Milk samples may be collected individually from affected quarters.
3. "Honey adulteration" refers to the act of adding some foreign substances into pure honey.

Test II. Choose the best answer for the following questions.

1. Which of the following milk sampling equipment is used for mixing the sample of milk? A. Dipers B. Agitator C. Sampling container D. None
2. One is the guiding principle of collecting Milk Samples.
   A. Avoid contamination, handle sample tubes properly
   B. The best time to sample is at milking time before the cow is milked
   C. Label the sampled milk with permanent marker
   D. All of the above

Test III. Short Answer Questions

1. What is honey?

Note: Satisfactory rating - 3 points **Unsatisfactory - below 3 points**

You can ask your teacher for copy of correct answers

Information 4 - Following Sampling Procedures

4.1. Milk Sampling Procedures

Sampling should be performed by an authorized, properly trained, person. That person shall be free from any infectious disease. Sampling for microbiological examination shall always be undertaken by an experienced person. Samples for microbiological examinations should be taken before other examinations, and using aseptic techniques and sterilized equipment and containers. It is important to obtain representative samples of the product. The following procedure can be followed for sampling of raw milk:

Steps to aseptically collecting milk samples:

1) Wash your hands and put on new disposable gloves.
2) Using a permanent marker, label a new sample tube with the date, cow ID, and the quarter that the milk will be collected from (RF for right front, LF for left front, RR for right rear, LR for left rear). Keep the sample tube closed until the sample will be collected.
3) Make sure that the udder and teats are clean and dry. Pre-dip the teats with an effective germicidal teat dip and leave the dip on for 30 seconds.
4) Wipe each teat dry with a single-use paper or cloth towel, making sure there is no teat dip left behind on the teat, as it will kill the bacteria in your milk sample.
5) Discard 3 to 4 streams of milk to minimize risk of contamination of the sample with bacteria in the teat canal.
6) Scrub teat ends with a cotton ball or gauze pad soaked in alcohol. Scrub until the cotton ball or gauze pad comes away clean. If sampling more than one quarter of the same cow, scrub far teats before scrubbing near teats. Use a new cotton ball

or gauze pad for each teat. Teats should not be dripping with alcohol, as the alcohol will kill the bacteria in your milk sample.

7) Open the sample tube immediately before the sample is taken. Do not let your hands or the teat end come into contact with the inside of the tube, including the lid.

Collect milk until the sample tube is ⅓ to ½ full, holding the tube at an angle to prevent loose dirt or hair from falling into it. Immediately close the tube once filled.

8) Immediately put the sample tube in the refrigerator or on ice. Samples that will not be plated within 24 hours should be frozen. It is best to freeze samples before shipping to the lab.

Procedure of collecting bulk tank milk samples:

Follow the following procedure while collecting bulk milk sample.

1) Agitate the milk in the bulk tank for 5 minutes before sampling.
2) Always collect the sample from the top of the bulk tank and never from the outlet as milk collected from the outlet is often contaminated.
3) Use a clean sanitized dipper or sterile syringe to collect the sample.
4) Fill the sample tube ½ full, as milk expands when frozen.
5) Immediately place samples on ice or in the refrigerator. Freeze samples that will not be plated within 24 hours.
6) Try to collect bulk tank milk samples 3-5 days in a row. This allows for greater accuracy than single day sampling for contagious pathogens.

4.2. Egg Sampling Procedures

Sampling procedures

Egg sample may be frozen, liquid, and powdered products. The sample usually consists of unopened containers, such as hermetically sealed cans or consumer packs (e.g., dehydrated egg products).The required number of sample units should be selected, which may be individual or composited sample units from individual cans or packs. Samples must be collected in an asceptic manner from homogeneous products. When practical, sealed primary containers should be collected and properly submitted to the laboratory for analyses. Storage of samples awaiting shipment to a laboratory must be under conditions appropriate for the type of product. The sample must be made homogeneous prior to analysis and kept in a hermetically sealed jar in a cool place. For all frozen samples, the sample is allowed to thaw, or is warmed in a water bath of temperature less than 50° C, homogenized and treated as for liquid samples in all

analyses. For all dried samples, the sample is prepared for analysis by being passed three times through a sieve with a mesh of approximately 1 mm2 to thoroughly break up any lumps.

Frozen egg

Drill diagonally through the frozen material in the can after opening with aseptic precautions. The sterile drill should be used, and about 50 g scrape of the drillings collected into a sterile container with a sterile spoon. Alternatively, a modified plastic funnel may be used with the electric drill to collect samples. The sample unit should be thawed for not more than 90 minutes at room temperature, or placed at the required amount of analytical unit directly into an homogenizer with the pre-enrichment medium in the case of Salmonella testing, or into appropriate diluents for other tests.

Dried egg

Open the original container or laboratory container (waxed carton or plastic bag) taking aseptic precautions, and spoon the appropriate amount of analytical unit directly into the pre-enrichment medium in the case of Salmonella testing, or into appropriate diluents for other tests.

Fat content of egg products: the fat content as determined by the method specified below.

Principle: The sample is hydrolysed by hydrochloric acid and the fat released is extracted by petroleum ether, recovered and calculated as a percentage by weight of the original sample.

Reagents

- Hydrochloric acid, concentrated (assay 36.5-38% HC1)
- Diethyl ether
- Petroleum ether, with any boiling range between 30 and 60o C

Materials

- Mojonnier extraction tube
- Water bath capable of being thermostatically controlled over the range 70-100^{o}C

- Oven capable of being thermostatically controlled at 100 ± 1°C (d) Soxhlet apparatus with suitable thimbles
- Analytical balance.

Procedure

1. Accurately weigh approximately 2 g liquid or frozen yolk product, 3 g of liquid or frozen whole egg product or 1 g dried yolk or whole egg product into a Mojonnier fat-extraction tube. Slowly add while vigorously shaking 10 ml of hydrochloric acid and, in the case of dried products, about 2 ml water, washing down any egg particles adhering to the sides of the tube.
2. Put the tube with sample in water bath set at 70 o C, bring to a boil and continue heating at boiling point for 30 minutes. Carefully shake the tube every 5 minutes during this time. After 30 minutes remove the tube, add water to nearly fill the lower bulb of the tube and cool to room temperature.
3. Add 25 ml of diethyl ether to the tube containing the sample and mix. Then add 25 ml of petroleum ether, mix and allow to stand until the solvent layer has cleared.
4. Draw off as much as possible of the ether-fat solution into a previously weighed flask containing anti-bumping granules. Before weighing the flask, dry it and a similar flask as counterpoise in an oven at 100o C and allow to stand in air until constant weight is obtained.
5. Re-extract the liquid remaining in the tube twice, using 15 ml of ether each time. Thoroughly shake on each addition of ether. Allow solutions to clear and draw off ether-fat solution into flask as previously.
6. Slowly evaporate the ether from the flask by carefully placing on a boiling water bath. Dry the fat by placing the flask in the oven at 100o C until constant weight is reached (probably after about 90 mins.). Remove flask and counterpoise from the oven and allow to cool to constant weight at ambient temperature (note: owing to the size of the flask and the nature of the material under test, there is less error by cooling in air than by cooling in a desiccator). Correct the weight obtained by a blank determination on the reagents used.

Expression of results

Formula and method of calculation

Fat content, as a percentage by mass of the sample, is given by: **m1/mo x 100,** where: **mo** = is the mass, in g, of the fat obtained after extraction and blank correction, **m1=** is the mass, in g, of the test portion of the egg product sample.

Repeatability

The difference between the results of two determinations carried out simultaneously or in rapid succession by the same analyst on the same sample shall not exceed 0.3 g fat per 100 g of sample.

4.3. Honey/bee bread Sampling Procedures

Acute and sub-lethal poisoning from pesticides can be a problem for beekeepers. Honey bees come into contact with pesticides outside the colony while foraging for nectar and pollen, and inside the colony while feeding, contacting beekeeper applied miticides, or contaminated comb wax. Honey bees gather pollen and nectar from many floral sources in their environment, store it in their colonies as fermented bee bread and feed it to developing brood. Therefore, the pesticides found in sampled bee bread is a snapshot of what pesticides that colony was exposed to in their outside environment at that time.

Bee Bread Sampling Protocol

List of equipment:

- Nitrile gloves
- Permanent marker
- Sample vial
- 10 wooden sampling sticks
- Aluminum foil

Procedure:

1. Reminder: Put on a new pair of nitrile gloves prior to sampling each set of colonies as this prevents cross-contamination between apiaries.
2. After you have taken the honey bee sample from the brood area for the honey bee health survey, look at the frames you have pulled to see if there are any cells with bee bread in them. If so, take one end of a sampling stick and insert it all the way to the bottom of the cell and rotate the stick all the way around the cell scraping the bee bread as you go. You may damage adjacent cells as the stick is slightly larger than a cell.
3. As you lift the stick from the cell, move slowly as the bee bread, although more wet than fresh pollen, is crumbly and may fall off the stick. Place the bee bread in the plastic container by scraping the stick on the inside mouth of the vial making sure that the bee bread falls into the sampling container. Repeat in at least 4 cells per each of the colonies to gather the minimum of 3 grams of bee bread. Use a new sampling stick per colony.
4. If the frame you removed for sampling does not have bee bread in it, set it aside and try to find another frame with bee bread. If you cannot find any bee bread in the colony, move to the next colony for sampling and try to get bee bread from it. If you cannot gather bee bread from a particular colony, it is necessary for you to take extra samples from the remaining colonies to collect the requisite total of 3 grams.
5. The sampling sticks and gloves can be disposed of in the trash and should not be used again.
6. Once all colonies have been sampled, close the vial, and label it with the corresponding sample ID (ex. MD-01-2020). Wrap it in aluminum foil to prevent sun exposure.

Shipping: Once all of the colonies in the yard have been sampled for pests and disease, place the labeled vials of bee bread into a freezer for storage.

Self-Check 4 – Written Test

Name_____ **ID**_____ **Date**_____

Directions: Answer all the questions listed below 3 point each. Examples may be necessary to aid some explanations/answers.

Test I. Write true if the statement is correct/False if it is incorrect for the following questions (2 point each).

1. Sampling should be performed by an authorized, properly trained, person.
2. Sample for microbiological examination is taken before other sampling.
3. Egg sample may be frozen, liquid, and powdered products.

Test III. Short Answer Questions (5 point each).

1. Discuss the sampling procedure for:
   A. Milk
   B. Honey

Note: Satisfactory rating - 8 points **Unsatisfactory - below 8 points**

You can ask your teacher for copy of correct answers

Information 5 - Asking Advices on collection and processing of samples

5.1. Introduction

The adequacy and condition of the sample or specimen received for examination are of primary importance. If samples are improperly collected: the laboratory results will be meaningless. Sampling protocol should be clearly defined. Start with description of primary food product.

Identity of the sample to be collected

Need to know:

- Number and size of sample to be collected
- Distribution of samples
- Stratification to be used

Sample label should be permanently attached to the sample

- Common name of food
- Sample code number
- Date of receipt in Lab

During sample collection:

- Collection details
- Date and time of collection
- Name of collector
- Place of origin
- Sampling point/addresses (roadside stall, farm, market)
- Condition of cultivation (feed regime, altitude, irrigation)
- Purchase price
- Graphical record (Photograph, visual record with scale)
- Transport conditions (mode and conditions of transport)

Deliver samples to the laboratory promptly with the original conditions maintained as nearly as possible If products are in bulk: storage procedures, choice of containers,

modes of transport should be considered. Use containers that are clean, dry, leak-proof, wide mouthed, sterile, and of a size suitable for samples of the product. Whenever possible, avoid glass containers, which may break. For dry materials, use sterile metal boxes, cans, bags, or packets with suitable closures. Identify each sample unit (defined later) with a properly marked strip of masking tape. Transport frozen or refrigerated products in approved insulated containers of rigid construction. If you miss important procedure on sample collection and process you have to ask advice for clarification.

Self-Check 5 – Written Test

Name_____ **ID**_____ **Date**_____

Directions: Answer all the questions listed below 3 point each. Examples may be necessary to aid some explanations/answers.

Test I. Write true if the statement is correct/False if it is incorrect for the following questions (5 point each).

1. After sample collection the sample should be labelled.
2. During sample collection date and time of collection should be noted.

Test I Short Answer Questions (5 point)

1. What are the considerations into account during sample collection?

Note: Satisfactory rating – 7.5 points **Unsatisfactory - below 7.5 points**

You can ask your teacher for copy of correct answers

Information 6 - Recording and Reporting Information

6.1. Documentation and Record Keeping

Records should be kept, as necessary and where practicable, to enhance the ability to verify the effectiveness of the food safety ystem. Documentation procedures can enhance the credibility and effectiveness of the food safety control system. Keeping accurate and up-to-date records is vital to the control of diseases. Any record keeping system should be accurate, reliable, easy to follow consistent as to the bbasis used and be very simple. Good record keeping is vital in regards to meeting the the organizational committements and providing accurate information on which decision is made for the future.

Another legal requirement is tha food firms maintain records relating to the manufacturer, processing, packing, distriution, receipt or importation of food products. The purpose is to assist in determinig whether anything has happened to the food or been done to the food that would render it unsafe (adultrated). Accordingly, firms must maintain records and government authorities may access the records.

With respect to food safety, records should be kept where necessary on:

- Prevention and control of animal diseases with an impact on public health
- Identification and movement of animals
- Regular control of udder haelth
- Use of veterinary drugs and pest control chemicals
- Nature and sources of feed
- Milk storage temperature
- Equipment claening
- Results of testing where testing is performed
- Health status of personnel
- Tracebility/product tracing recall

Types of Recors

To keep recor simply to collect relevant information that can help to take good decision and important to keep track of activities. Production and important events.

The major types of records which are all described below:

1) Identification records
2) Breeding records
3) Production records
4) Disease and treatment records
5) Financial records

Making records management best practices the guiding light of operations will help mitigate the risk of non-compliance. The following are principles that will help to stay compliant without compromozing operational efficiency.

1) Prioritise security and privecy
2) Record track, and monitor documents
3) Create and implement a records management stratagy
4) Annual/monthly review/audit
5) Destroy records at the end of their lifecycle
6) Ensure records and information architecture is correct and efficient
7) Capture records without disrupting the way end users work
8) Digitalize physical records

Advantages of Record Keeping

- Records provides basis for evaluation of animals from past records hence helps in selection and culling animals
- Helps in preparing pedigree and history records of animals
- Helps in assessing the past records and designing better breeding plans to check inbreeding, selecting superior parents and helps in better replacement and culling practices
- Helps in monitoring hygiene and sanitation of food, environment and personal

- Helps in detection of abnormal conditios or diseases status of the herd that leads to loss in body weight, loss in milk production
- Helps in fixing proper prices of milk, egg and meat for sale
- Helps in estimating the cost of milk production
- Helps to compare herd performance

6.2. Record Reporting

Record reporting is an essential element of bussiness/firm management. A reporting guideline provide a minimum list of information needed to ensure a manscript can be for exaple:

- Understood by a reader
- Replicated by a researcher
- Used by a veterinarian to make a clincal decision
- Include all necessary points

Self-Check 6 – Written Test

Name_____ **ID**_____ **Date**_____

Directions: Answer all the questions listed below 3 point each. Examples may be necessary to aid some explanations/answers.

Test I. Write true if the statement is correct/False if it is incorrect for the following questions (3 point each).

1. Records should be kept to enhance the ability to verify the effectiveness of the food safety system
2. Documentation procedures can enhance the credibility and effectiveness of the food safety control system.

Test III. Choose the best answer for the following questions (2 point).

1. With respect to food safety, records should be taken for:
   A. Regular control of udder haelth
   B. Use of veterinary drugs and pest control chemicals
   C. Nature and sources of feed
   D. Milk storage temperature
   E. All of the above

Test I Short Answer Questions (2 point each)

1. Write and discuss type of records.
2. What are the importance of record keeping?
3. What are the minimum reporting guideline to provide correct of information?

Note: Satisfactory rating - 7 points **Unsatisfactory - below 7 points**

You can ask your teacher for copy of correct answers

Operation Sheet: 1. Collecting milk samples

Objective: Aseptically Collecting milk sample

Materials: (Gloves, Water, soap, Marker cloth towel, cotton ball or gauze pad, alcohol, universal bottle, ice box)

Procedure:

1) Wash your hands and put on new disposable gloves.
2) Using a permanent marker, label a new sample tube with the date, cow ID, and the quarter that the milk will be collected from (RF for right front, LF for left front, RR for right rear, LR for left rear). Keep the sample tube closed until the sample will be collected.
3) Make sure that the udder and teats are clean and dry. Pre-dip the teats with an effective germicidal teat dip and leave the dip on for 30 seconds.
4) Wipe each teat dry with a single-use paper or cloth towel, making sure there is no teat dip left behind on the teat, as it will kill the bacteria in your milk sample.
5) Discard 3 to 4 streams of milk to minimize risk of contamination of the sample with bacteria in the teat canal.
6) Scrub teat ends with a cotton ball or gauze pad soaked in alcohol. Scrub until the cotton ball or gauze pad comes away clean. If sampling more than one quarter of the same cow, scrub far teats before scrubbing near teats.
7) Open the sample tube immediately before the sample is taken. Collect milk until the sample tube is ⅓ to ½ full, holding the tube at an angle to prevent loose dirt or hair from falling into it. Immediately close the tube once filled.
8) Immediately put the sample tube in the refrigerator or on ice. Samples that will not be plated within 24 hours should be frozen. It is best to freeze samples before shipping to the lab.

Operation Sheet: 2. Collecting bulk milk samples

Objective: Aseptically Collecting milk sample

Materials: (Gloves, Water, soap, Marker universal bottle, ice box, dipper, sterile syringe)

Procedure:

1) Agitate the milk in the bulk tank for 5 minutes before sampling.
2) Always collect the sample from the top of the bulk tank and never from the outlet as milk collected from the outlet is often contaminated.
3) Use a clean sanitized dipper or sterile syringe to collect the sample.
4) Fill the sample tube ½ full, as milk expands when frozen.
5) Immediately place samples on ice or in the refrigerator. Freeze samples that will not be plated within 24 hours.
6) Try to collect bulk tank milk samples 3-5 days in a row.

Operation Sheet: 3. Bee Bread/Honey Sampling Protocol

Objective: Aseptically Collecting milk sample

Materials: (Gloves, Nitrile gloves, Permanent marker, Sample vial, 10 wooden sampling sticks, Aluminum foil)

Procedure:

1. Put on a new pair of nitrile gloves prior to sampling each set of colonies as this prevents cross-contamination between apiaries.
2. After you have taken the honey bee sample from the brood area for the honey bee health survey, look at the frames you have pulled to see if there are any cells with bee bread in them. If so, take one end of a sampling stick and insert it all the way to the bottom of the cell and rotate the stick all the way around the cell scraping the bee bread as you go.
7. As you lift the stick from the cell, move slowly as the bee bread, Place the bee bread in the plastic container by scraping the stick on the inside mouth of the vial making sure that the bee bread falls into the sampling container. Repeat in at least 4 cells per each of the colonies to gather the minimum of 3 grams of bee bread. Use a new sampling stick per colony.
8. If the frame you removed for sampling does not have bee bread in it, set it aside and try to find another frame with bee bread. If you cannot find any bee bread in the colony, move to the next colony for sampling and try to get bee bread from it. If you cannot gather bee bread from a particular colony, it is necessary for you to take extra samples from the remaining colonies to collect the requisite total of 3 grams.
9. The sampling sticks and gloves can be disposed of in the trash and should not be used again.
10. Once all colonies have been sampled, close the vial, and label it with the corresponding sample ID.

LAP TEST

Name_____ **ID**_____ **Date** _____

Time started: _____ **Time finished:** _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 1 hour. The project is expected from each student to do it.

During your work: You can ask all the necessary tools and equipment

Lap Test Title:

1. Aseptically collect milk samples
2. Aseptically collect bulk milk samples
3. Collect bee bread/Honey samples

Task1. Perform milk sample collection.

Task 2. Perform bulk milk sample collection.

Task 3. Perform bee bread/honey sample collection.

LG 95	LO 3. Assist In Quality Assessment Of Milk, Egg and Honey

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Identifying and maintaining materials, equipment and tool
- Performing basic physical, chemical and microbial test of milk.
- Performing egg collection, handling and grading system.
- Performing honey collection, handling, and grading
- Recording and interpreting results

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Identify and maintain materials, equipment and tool
- Perform basic physical, chemical and microbial test of milk.
- Perform egg collection, handling and grading system.
- Perform honey collection, handling, and grading
- Record and interpret results

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the "Information Sheets". Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the "Self-checks" which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to "Operation sheets
7. Perform "the Learning activity performance test" which is placed following "Operation sheets" ,
8. If your performance is satisfactory proceed to the next learning guide,
9. If your performance is unsatisfactory, see your trainer for further instructions or go back to "Operation sheets".

Information 1 - Identifying and maintaining materials, equipment and tool used for Quality Assessment of milk, eggs and Honey

1.1. Introduction

Unsanitary conditions regularly lead to contamination food. Working areas should be kept as clean as possible. Accumulation of feces/urine greatly increases the likelihood of microbial contamination of food of animal origin (honey, egg, milk...) similarly, equipments used for collection of sample can easily introduce bacteria to both the food and animal through unwashed hands and clothing. Improper or insufficient cleaning of equipments, containers often leads to contamination of food of animal origin. Therefore, it is important to use containers that can be easily cleaned. However, if the wrong chemicals are used to clean equipments, containers, or if containers are not properly rinsed after cleaning, food can become contaminated with these chemicals.

1.2. Maintaining Materials, Equipment And Tool Used For Quality Assessment Of Milk

- Milk Measure Sets
- Milk Sample Bottles
- Milk Centrifugal machine 8 tubes
- Ultrasonic milk stirrer
- Transparent borosilicate glass
- Sample bottle stand
- Apron/lab coat
- Milk ultra analyzer
- Milk pipettes
- Milk testing centrifuge machine 24 tube
- Centrifuge tubes
- Spoon
- Incubator
- Lactometer
- Flame
- Beaker
- Graduate cylinder
- Ethanol
- Flask
- Glass rod
- Sterile test tubes
- Petri dish
- Cell spreader

1.3. Maintaining Materials, Equipment And Tool Used For Quality Assessment Of Egg

Sanitation is an important factor in maintaining egg quality. The exterior of the egg shell is usually clean and sterile when the egg is first laid. From the time the egg is laid, however, it is exposed to large numbers of microorganisms, which under certain conditions, can penetrate the egg shell and contaminate the egg. The result can be lowering of the quality of the egg and eventual loss of the egg as an edible product.

Egg quality defines those characteristics of an egg that affect consumer acceptability and preference. Components of quality include shell quality and interior egg quality for shell eggs, and interior egg quality for further processed eggs. The quality of the egg once it is laid cannot be improved. Hence, its maintenance is mostly a preventive process. Egg quality is influenced by several factors including rearing, temperature, humidity, handling, storage, and egg age.

ome significant egg qualities are egg size, egg shape, shell color, shell condition, Eggshell thickness and strength, albumen quality, yolk quality, air cell quality, etc. For evaluation of these quality parameters, the requirements are as follows:

- Egg weighing balance (for egg size)
- Vernier Caliper (for egg shape)
- Egg candler which is wax or electric (for shell soundness; air cell, albumen and yolk qualities)
- Screw gauge (for shell strength)
- Scale expressed in cm and mm (for the depth of air cell)
- Glass containers (for egg contents, etc.)
- Special types of Brine solutions of known specific gravity ranging from 1.062 to 1.09.0 (for specific gravity of egg

1.4. Maintaining Materials, Equipment and Tool Used For Quality Assessment Of Honey

The quality of honey and its specific character are determined by the specific flora and vegetation in the area from which the honey originates and the diversity of the ecosystem in which the bees are kept, specifically in non-industrial areas. According to report inadequate of production knowledge and poor post-harvest handling system often results in poor of honey quality. Excessive using smoking materials during honey harvesting and inappropriate storage containers are the main problems in honey quality. Hone quality can be affected by different underlying causes. The following are some examples of equipments used to test the quality of hone.

Materials and Equipments

- Portable honey refractometer
- Match stick flame
- Flash light
- Water
- Honey
- Glass rode
- Beaker
- Spectroscopy

Self-Check 1 – Written Test

Name_____ **ID**_____ **Date**_____

Directions: Answer all the questions listed below 3 point each. Examples may be necessary to aid some explanations/answers.

Test I Short Answer Questions (4 points each)'.

1. List materials and equipments used to assess the quality of milk.
2. Describe materials and equipments used to assess quality of honey.
3. Describe materials and equipments used to assess quality of honey.

Note: Satisfactory rating - 6 points **Unsatisfactory - below 6 points**

You can ask your teacher for copy of correct answers

Information 2 - Performing Basic Physical, Chemical and Microbial Milk Test

2.1. Introduction

Milk is the normal mammary secretion of milking animals obtained from one or more milkings without either addition to it or extraction from it, intended for consumption as liquid milk or for further processing "**Adulterated milk and milk products**," any milk or milk product which bears or contains any poisonous or deleterious substance in a quantity which may render it injurious to health; bears or contains any added poisonous or deleterious substances for which no safe tolerance has been established by state or federal regulation or in excess of any tolerance established; consists in whole or in part of any substance unfit for human consumption; has been produced, processed, prepared, packed, or held under unsanitary conditions; has a container composed in whole or in part of any poisonous or deleterious substance which may render the contents injurious to health; or has any substance added to it or mixed or packed with it to increase its bulk or weight, reduce its quality or strength, or make it appear better or of greater value than it is

2.2. Assessing milk quality

Good quality dairy products can only be made from good quality milk. Therefore, it is important to grade milk, so that poor quality samples are rejected and only good quality milk is sold to retailers and processors. To do this, farmer cooperatives and milk traders must know how to test the milk they produce or receive from individual farmers. Similarly, dairy staff must have knowledge of various quality control tests. They should be able to identify off-flavors, and understand what causes these problems. Here, we describe four simple quality control tests. These tests will meet the requirements of most farmer cooperatives, collection centers and small-scale processing units. If the tests are done properly and consistently, it will ensure that poor quality milk is rejected, and only good quality milk is sold to processing factories, milk bars and shops.

Figure10. Measuring milk temperature

Characteristics and Flavour of Milk

Milk is a yellowish-white non-transparent liquid. Fresh milk has a pleasant soft and sweet taste and carries hardly any smell. Consumer acceptance of milk is greatly affected by its flavour. There are several factors which may produce off-flavours and/or odours in milk. Some of the more common causes of flavour and odour problems are:

- Feed and weed flavours
- Strong smelling plants, like wild onion or garlic
- Strong flavored feedstuffs such as poor quality silage
- Cow-barn flavors from dung, etc. These are found when milk is obtained
- From a dirty or poorly ventilated environment or from improperly cleaned milking equipment.
- Rancid flavours. These are caused by excessive agitation of milk during collection and/or transport. Damage of the fat globules in the milk results in the presence of free fatty acids.
- High acidity flavours
- Oxidized flavours, from contact with copper or exposure to sunlight
- Flavours from the use of chlorine, fly sprays, medications, etc.

Milk quality control is the use of approved tests to ensure the application of approved practices, standards and regulations concerning the milk and milk products. The tests are designed to ensure that milk products meet set standards for composition and purity as well as accepted levels of different micro-organisms and somatic cells.

2.3. Perform Basic Physical Tests of Milk

The following platform tests can be applied during milk collection and reception at the collection centre and/or the milk plant:

1. Sight and smell test (organoleptic test)

The sight and smell test of raw milk and milk products is done using normal senses of sight and smell in order to observe and record the overall quality. We get an instant result where and when it is carried out. If used correctly, it is very useful to do rapid screening of physical quality of milk. It is applicable on farms, during milk collection, at milk reception and at the milk processing plant. It is the first and basic test for judgement of qualities of milk and various milk products. This test, of course, should be complemented by further laboratory tests. When milk is tested by taste to judge the quality of milk there is a risk of disease transmission, and this is not recommended from a health point of view. The sight and smell test should be carried out immediately after opening the lid of the milk can/ container by following means-

- Observe the colour, appearance, and cleanliness of milk
- Smell the milk just above the milk surface immediately after removal of the lid.
- Taste of milk is more permanent and easy to define than smell. Before tasting the milk, ensure that the raw milk is from healthy dairy animal. Do not perform the test using raw milk if it is not very essential because of risk associated with milk born zoonosis.

The following are the abnormalities that can be detected by organoleptic testing:

• Abnormal colour/consistency/ visible dirt and interpretation

Table 2. Interpretation of organoleptic test

Colour/consistency/ visible dirt	**Interpretation**
Pink colour	Contaminated with blood
Yellowish creamy colour	Colostrum or late milk
Thin creamy colour	Adulterated by adding water
Large clots or flakes	Sour milk or milk from cow suffering from mastitis
Small white clots or grains	Milk from cow suffering from mastitis or milk Adulterated with flour and skim milk powder. Can also be early spoiling.
Visible dirt and impurities (fragments of straw, cow dung, etc.)	Milk produced under unhygienic conditions

Off-flavours from feeds

- Garlic, onion, beets, bad silage, certain plants and pastures can cause off-flavours to milk
- Absorption of off-flavours from air, milk containers etc.
  - ✓ It is well known that milk and cream can absorb smelling compounds from the air. This is caused by the ability of butter fat to absorb, especially after milking when the milk is warm, strong smells like paint, phenol, cresol, lysol, petroleum, etc. Strongly smelling paints, disinfectants and other chemicals should not be handled and stored in places where the dairy animals are kept and milked.
  - ✓ Storage of milk together with fruits and fish also causes off-flavours to milk Abnormal smell and/or taste and interpretation

Table 3. Odour interpretation of organoleptic test of milk

Smell and/or taste	Interpretation
Souring	Lactose fermenting, acid producing bacteria
Bitter	Peptonising of milk by Streptococcus liquefaciens
Blue souring	unpleasant sweet and sour smell, thin and waterish appearance caused by bacterial activity and storage in a closed container without ventilation
Fruit aroma	Pseudomonas producing esters
Slimy milk	Indicates capsule forming bacteria, e.g. Aerobacter aerogenes and Alcaligenes viscosus
Bubbles, coagulation and whey separation	Fermentation by yeast

In order to conduct organoleptic test, a test panel of milk tasters should be employed. The milk tasters should have good sense of sight, smell and taste of milk. No equipment is required for organoleptic testing. The milk tasters should test the milk and make observation on its taste and smell. Since raw milk testing may pose risk of zoonotic disease to human health, it is advisable to avoid organoleptic testing of raw milk, if it is not very essential.

Figure 11. Organoleptic testing

2. Lactometer or density test

If during the organoleptic inspection the milk appears to be too thin and watery and its colour is “blue thin”, it is suspected that the milk contains added water. The lactometer test serves as a quick method to determine adulteration of milk by adding water. The test is based on the fact that the specific gravity of whole milk, skim milk and water differ from each other. Farmers, milk traders, transporters and shops often add water and other substances to milk, to increase their profits. This is a common problem, but can be easily tested with a lactometer, which is an instrument used to measure the density of milk. Pure milk has a density (specific gravity) of **1.026 to 1.032** grams per ml. Addition of water or other substances changes the density. Addition of water reduces the density, while addition of solids increases the density considerably. If density is outside the normal range, it means the milk has been adulterated.

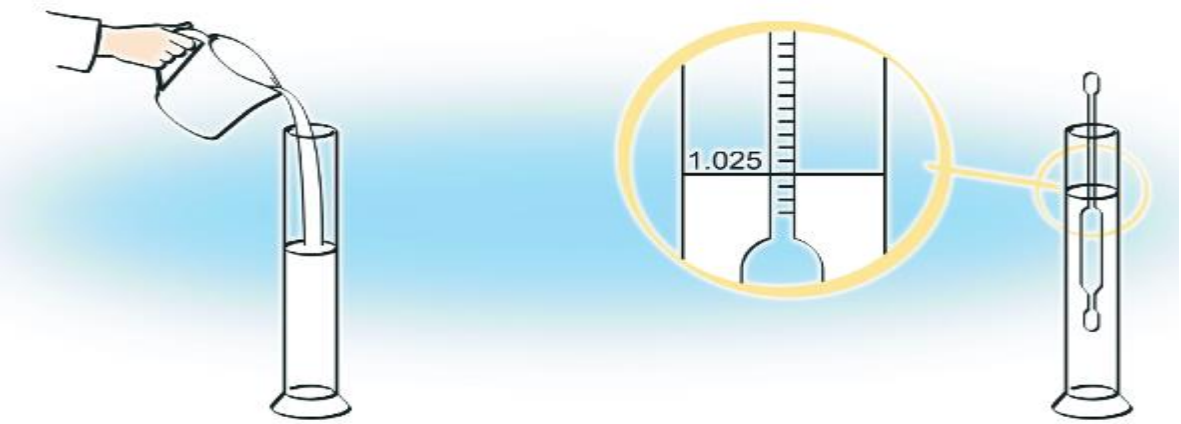

Figure 12. Lactometer detect adulteration of milk

Materials

- Measuring cylinder 200-250 ml
- Lactometer

Procedure

1) First, ensure that the milk temperature is about 20°C. Hot milk should be left to cool at room temperature for at least 30 minutes. If the milk was cooled below 10°C, warm it to 40°C, and then cool it to 20°C.

2) Mix the milk sample and gently pour about 200 ml into a measuring cylinder. Slowly dip the lactometer into the milk and leave it. It will sink a little and then stop. Now take the lactometer reading just above the surface of the milk.

4. Extraneous matter

Procedure

In order to find out extraneous matter in milk, the following method should be used

1. Strain the milk sample;
2. Allow the milk to settle in the container and observe at the top fatty layer as well as at the bottom of the container;
3. The milk sample can also be centrifuged for few minutes to get the extraneous matter

Observations and interpretation

- Feed particle in milk: indicates poor management of feed and fodder
- Dung particle in milk :indicates uncleaned cow
- Dust particle in milk: indicates milk got exposed to dirty environment

Chemical Examination of Milk

1. Alcohol test

In case there is any reason to suspect that milk is sour, the alcohol test is used for rapid determination of an elevated acidity of milk. The test is carried out by mixing equal quantities (2 ml) of milk and of a 68% ethanol solution (made by mixing 68 ml of 96% alcohol with 28 ml distilled water) in a test tube. If the milk contains more than 0.21% acid, this results in coagulation of the milk proteins and the milk is sour. The milk will clot and is not fit for any process which involves heating, like pasteurization.

Materials

- Alcohol gunner or syringe
- Beaker or glass
- 68% alcohol

Procedure

1. Put equal volumes of milk and 68% alcohol in a test tube (e.g. 2 ml of milk in 2 ml of 68% alcohol).
2. Invert the test tube several times, keep your thumb pressed tightly over the open end of the tube.
3. Examine the tube to see whether the milk has coagulated. If it has, fine particles of curd will be visible.

Figure 13. Alcohol test

2. Determination of pH in milk

The measurement of pH in milk is important in testing for impurities, spoilage, and signs of mastitis infection. Milk is slightly acidic or close to neutral pH. For all species, milk with colostrum has a lower pH and mastitic milk has a higher pH. Fresh milk has a pH value of 6.7. When the pH value of the milk falls below pH 6.7, it typically indicates spoilage by bacterial degradation. Eventually, when the milk reaches an acidic enough pH, coagulation or curdling will occur along with the characteristic smell and taste of

"sour" milk. Mastitis is an ever-present challenge with dairy milking cows. A pH measurement offers a quick way to screen for infection of the udder Determination of pH of milk can be me done by two methods as stated below:

1) By using indicator strips
2) By using pH meter

By using indicator strips

Procedure

1. Indicator paper strips are made by soaking strips of absorbent paper in a suitable indicator and drying them
2. A rough estimate of pH is obtained by dipping a strip of the prepared paper in milk and observing the colour
3. Bromocresol purple (pH range 5.2 to 6.8 – colour changes from yellow to purple) and bromothymol blue (pH range 6.0 to 7.6 – colour changes from straw-yellow to bluish-green) are commonly used as indicators
4. Both narrow and wide range ready-made indicator papers are available
5. commercially over the pH range 2.0 to 10.5

By using pH meter

Procedures

1. Take 50 ml of milk sample at 30°C in a 100 ml glass beaker
2. Measure the pH of milk with help of a calibrated pH meter (calibrated with a standard buffer of known pH value i.e. pH 7.0 or 9.2) by dipping the electrode in the beaker
3. Read the pH of the milk after 30 sec

3. Clot on boiling test

This test is done for assessment of keeping quality of milk. Formation of clot means milk is no longer marketable. This test is quick and simple. It allows to check whether the milk has high acidity (pH < 5.8). High-acid milk should be rejected. The test allows to identify colostral milk (which is produced in the first few days after parturition) or mastitic

milk. Colostral milk should be rejected, because it has a very high percentage of whey proteins, which create problems when the milk is boiled or heated during processing.

Apparatus and materials required

- Test tube
- Water bath
- Spirit lamp
- Milk sample

Procedure

1. Transfer 5 ml of the sample to the test tube and smell for any acidic flavour
2. Place the tube in a boiling water bath and hold for about 5 minutes, and smell again for any acidic flavour
3. Remove the tube from the water bath and rotate it in an almost horizontal position and examine the film of milk or side of the test tube for any precipitated particles
4. Alternately, take 5 ml of milk in a test tube, boil on the flame of a spirit lamp and examine the film of milk or side of the test tube for any precipitated particles

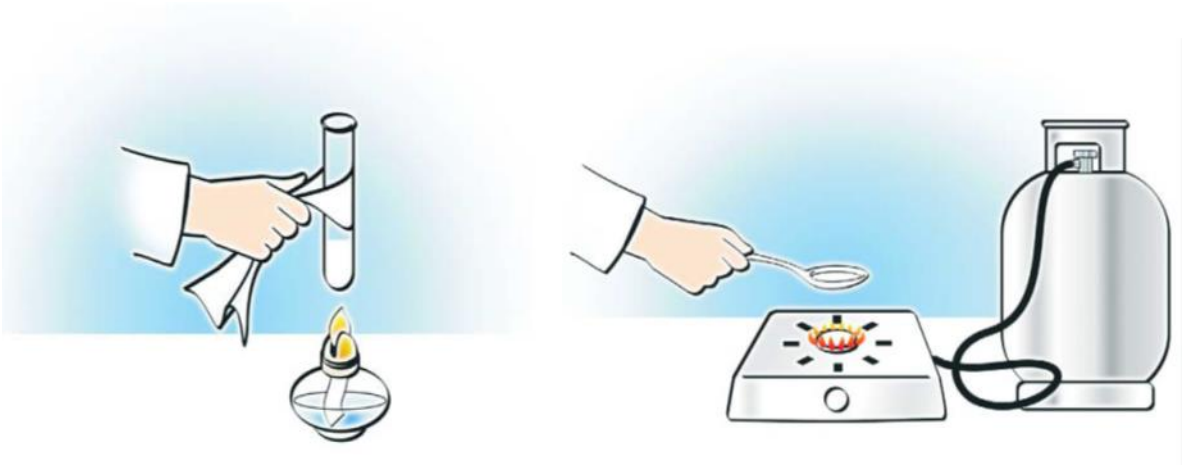

Figure 14. Clot on oiling test

Results

If the milk is of good quality, there will be no coagulation, clotting or precipitation. If the milk has become acidic (pH below 6.4) it will flocculate. To quickly see whether milk is acidic, you can use a litmus paper.

4. Phosphatase test for pasteurized milk

Pasteurization is an essential process of making milk safe and free from pathogens. Alkaline phosphatase is an enzyme which is naturally present in milk, but is destroyed at a temperature just near to the pasteurization temperature. Alkaline phosphatase test is used to indicate whether milk has been adequately pasteurized or whether it has been contaminated with raw milk after pasteurization. The test is not applicable to sour milk and milk preserved with chemical preservatives.

Apparatus required

- Lovibond All-Purpose Comparator with stand
- Standard Discs - giving 0, 6, 10, 18, 42 or 0, 6, 10, 14, 18, 25, 42 readings.
- Fused Glass cells - 25 mm.
- Test-Tubes - 15 x 1.9 cm, fitted with rubber stoppers.

Reagents required

- Buffer solution - 3-5 g of sodium carbonate analytical reagent grade and 1.5 g of sodium bicarbonate analytical reagent grade dissolved in 1ltr of water.
- Substrate - disodium p-nitrophenylphosphate not less than 95 percent pure.
- Buffer substrate - Transfer 0.15 g of the substrate into a 100 ml measuring cylinder or stoppered graduated flask and make up to the mark with the buffer solution.

The solution should not be stored for long periods but may normally be kept in a refrigerator for up to one week. The solution is practically colourless; when viewed through a 25 mm cell in the all-purpose comparator, it should give a reading of less than 10 on the disc.

Procedure

1. Take 10 ml of the buffer substrate solution into test-tubes marked at 10 ml and bring to 37 to 38°C in a water-bath
2. Add 2 ml (one ml if 5 ml of buffer substrate are used) of the milk to be tested, close the tubes with rubber stoppers and invert to mix
3. Prepare in the same way a blank from a boiled milk of the same type as that under test.
4. Incubate all the tubes at 37-38°C
5. Read the yellow colour after 30 minutes, return to the bath, and take a second reading after incubation for a further 90 minutes
6. The yellow colour is read in a Lovibond all-purpose comparator on a resazurin stand, fitted with the disc calibrated in microgram p-nitrophenol
7. Readings are taken by looking down on to the two apertures with the comparator facing a good source of north daylight; the disc is revolved until the sample is matched; readings falling between two standards are recorded to the nearest reading

Table 4. Phosphatase test interpretation

Disc reading after 30 minutes incubation	**Interpretation**
0 or trace 6	Properly pasteurized Doubtful
10 or over	Under pasteurized
Disc reading after 2 hours incubation	
0 to 10	Properly pasteurized
Over 10	Under pasteurized

The 30-minute test will reveal any serious fault in pasteurization, but to enable minor errors to be detected, readings shall be taken after further incubation for 90 minutes.

5. Determination of titratable acidity as lactic acid

The titratable acidity test is employed to ascertain if milk is of such a high acidity so as to reduce its keeping quality and heat stability. Generally the acidity of milk means the total acidity (Natural + developed) or titratable acidity. It is determined by titrating a known volume of milk with a standard alkali. Determination of titratable acidity of milk as Lactic Acid can be me done by two methods as stated below:

A. Conventional method

B. By using paper strip test with color comparator

A. Conventional method Apparatus and materials required

- 100 ml conical flask
- Distilled water
- Phenolphthalein indicator
- N/10 NaOH
- Milk sample

Procedure

1. Take 10 ml milk in 100 ml conical flask, add 10 ml distilled water Calculate the acidity % as volume of NaOH used×0.09
2. Add 1ml phenolphthalein indicator and titrate against N/10 NaOH till a faint pink colour appears

Calculation

Titratable acidity % (as lactic acid) = 9V1N/ V2 Where

- V1 = Volume in ml of the standard sodium hydroxide required for titration,
- N = Normality of the standard sodium hydroxide solution, and
- V2 = Volume in ml of milk taken for the test

B. By using paper strip test with color comparator

These strips are commercially available in the market. Standard Laboratory Protocol on Testing Milk Samples for Quality and Safety

Procedure: As per the instruction given within the kit

Advantage of using Milk Adulterant Kit:

- It gives an instant result.
- Easy to perform.

3.3. Microbial Examination of Milk

Milk is an important food diet of vast population on earth, due to its high nutritional value for human beings. Milk is an excellent growth medium of microorganism when suitable temperature exists. If it is produced unhygienically and handled carelessly, it gets contaminated very easily leading to its early spoilage. Many milk borne epidemics of human diseases have been spread by contamination of milk by spoiled hands of dairy workers, unsanitary utensils, flies, and polluted water supplies.

The quality of milk is determined by aspects of composition and hygiene. Due to its complex biochemical composition and high water activity milk serves as an excellent culture medium for the growth and multiplication of many kinds of microorganisms. Coliforms are considered as normal flora of intestinal tract of human and animals. They have been used as indicator organisms for bacteriological quality of milk and its products. Coliform count is always being taken as a definite index of fecal contamination of milk and milk products, but that besides the possible presence of enteric pathogens which may constitute health hazards to the consumers. The most important index of microbiological quality is total bacterial count, coliform count, yeast and moulds count and detection of specific pathogens and their toxins.

California Mastitis Test

Identification of cows sub-clinically infected with mastitis is an important part of mastitis control programs. Cows with subclinical mastitis infections do not have a swollen udders or abnormal looking milk. However because an infection is present the somatic cell count in the milk will be elevated. The California Mastitis Test (CMT) is a simple, inexpensive way of detecting unseen infections. Unlike other tests that require laboratories to interpret the results, the CMT is a cow side test that gives valuable, rapid results.

Equipment

Milk collected for CMT should be collected in a hygienic manner. Samples of milk from each quarter should be collected in a clean CMT Paddle free of any milk residue. The CMT paddle has four shallow cups marked A, B, C, and D for easy identification of the individual quarter from which the milk was obtained. The CMT solution should be properly reconstituted according to package instructions.

Procedure

1. About ½ teaspoon (2 cc) of milk is taken from each quarter. There is the amount that would be left in the cups when the paddle is held nearly vertical, or in an upright position.
2. An equal amount of CMT reagent is added to each cup in the paddle.
3. The paddle is then rotated in a circular motion to thoroughly mix the contents. The mixing should not last more than 10 seconds.
4. The test must be “read” quickly because the visible reaction tends to disintegrate after about 20 seconds. The reaction is visually scored depending on the amount of gel that forms. The more gel, the higher the score.

Reading a CMT Test

N = negative. There is no evidence of thickening in the mixture.

T = trace. There is a slight thickening of the mixture. Trace reactions seem to disappear with a continued rotation of the paddle.

1= weak positive. There is a distinct thickening of the mixture, but there is no tendency to form a gel. If the paddle is rotated 20 seconds or more, the thickening may disappear.
2 = distinct positive. There is immediate thickening of the mixture with a slight gel formation. As the mixture is swirled, it moves toward the center of the cup, exposing the bottom of the outer edge. If the motion stops, the mixture levels out and covers the bottom of the cup.

3 = strong positive. A gel is formed and the surface of the mixture becomes elevated (like a fried egg). A central peak remains projected even after the paddle rotation is stopped

Interpretation of CMT Scores

CMT scores are directly related to average somatic cell counts. The following table shows how they are related. As indicated, the somatic cell range can vary from 0 to over 5 million cells per milliliter of milk. Any reaction of trace or above indicates that the quarter has subclinical mastitis.

Table 5.CMT score intpretation

CMT Score	Somatic Cell Range	Interpretation
N (Negative)	0 – 200,000	Healthy Quarter
T (Trace)	200,000 – 400,000	Subclinical Mastitis
1	400,000 – 1,200,000	Subclinical Mastitis
2	1,200,000 – 5,000,000	Serious Mastitis Infection
3	Over 5,000,000	Serious Mastitis Infection

Advantages of the CMT

The CMT is fairly accurate in measuring the somatic cell concentration in milk and correlates well with other tests.

- It is sensitive.
- It is inexpensive.
- The test is simple and requires little equipment.
- The paddle is easy to clean up – simply rinse with water.

Disadvantages of the CMT

- Test scores may vary between individuals performing the test.
- Scores represent a range of somatic cells present rather than an exact count.
- Cows fresh less than 10 days or cows that are nearly dry may produce a false positive reaction. Cows should be tested closer to the middle of their lactation.
- Occasionally, acute clinical mastitis milk will not score positive if the somatic cells have been destroyed by toxins from the infecting organism

Self-Check 2 – Written Test

Name_____ **ID**_____ **Date**_____

Directions: Answer all the questions listed below 3 point each. Examples may be necessary to aid some explanations/answers.

Test I. Write true if the statement is correct/False if it is incorrect for the following questions (3 points each).

1. Fresh milk has a pleasant soft and sweet taste and carries hardly any smell.
2. Alcohol is the first and basic test for judgement of qualities of milk and various milk products using sense organs.
3. The quality of milk is determined by aspects of composition and hygiene.
4. The lactometer test serves as a quick method to determine adulteration of milk by adding water.

Test III. Choose the best answer for the following questions (2 points each).

1. Which of the following test is used to detecting unseen infections?
   A. Organoleptic test B. Alcohol test C. CMT D. Clot on oiling test
2. One is microbiological test.
   A. CMT B. Determination of titratable acidity as lactic acid
   C. Phosphatase test for pasteurized milk D. Lactometer test

Test III. Short Answer Questions (5 point).

1. Discuss the advantage and disadvantage of California mastitis test.

Note: Satisfactory rating - 12 points Unsatisfactory - below 12 points

You can ask your teacher for copy of correct answers

3.1. Quality Assessment of Eggs

The quality of eggs is paramount to egg producers as they strive to meet the expectations of customers, realize their internal financial objectives and ensure the sustainability of egg production. Poor egg shell quality or inconsistent yolk color will have serious financial consequences. The quality parameters considered were: HU, and air cell height (mm). Haugh unit (HU) is the standard method for determination of interior egg quality. Albumen height measurements were recorded using the standard tripod micrometer. Eggs were weighed to the nearest 10th of a gram prior to testing. After weighing, the eggs were broken out onto a glass break-out table for albumen height measurement. The thick albumen height was measured by averaging three measurements carried out at different points of the thick albumen and approximately 10 mm from the yolk and the edge of the thick albumen with a tripod micrometer

1) Egg Structure

The egg is made of three distinct parts, the shell (10% of weight), the albumen (60% of weight) and the yolk (30% of weight), each contributing to the great success of eggs as a complete nutritious food. The shell provides both physical and biological protection from the environment and regulates the exchanges of water and gases. The shell inner and outer membranes constitute the base upon which the precipitation of calcium carbonate on the organic matrix produce the shell in about 20 hours during the passage in the uterus.

The cuticle, containing a large portion of the superficial pigments, is laid on the surface of the egg. At the large end of the egg, the air cell is formed after laying when gases penetrate through the numerous pores in the shell. Its size increases with time as eggs lose moisture. The yolk, surrounded by the vitelline membrane, contains about 50% water, 30% lipids and 17% proteins. In addition, the yolk is rich in fat soluble vitamins (A, D, and E), minerals (Phosphorus), and carotenoids, which give the yolk its golden color. The albumen or egg white (thick and thin, chalazae and chalaza layer) consists

mostly of water and proteins (10%). The chalazae, attached to the thick albumen, anchors the yolk to the center of the egg.

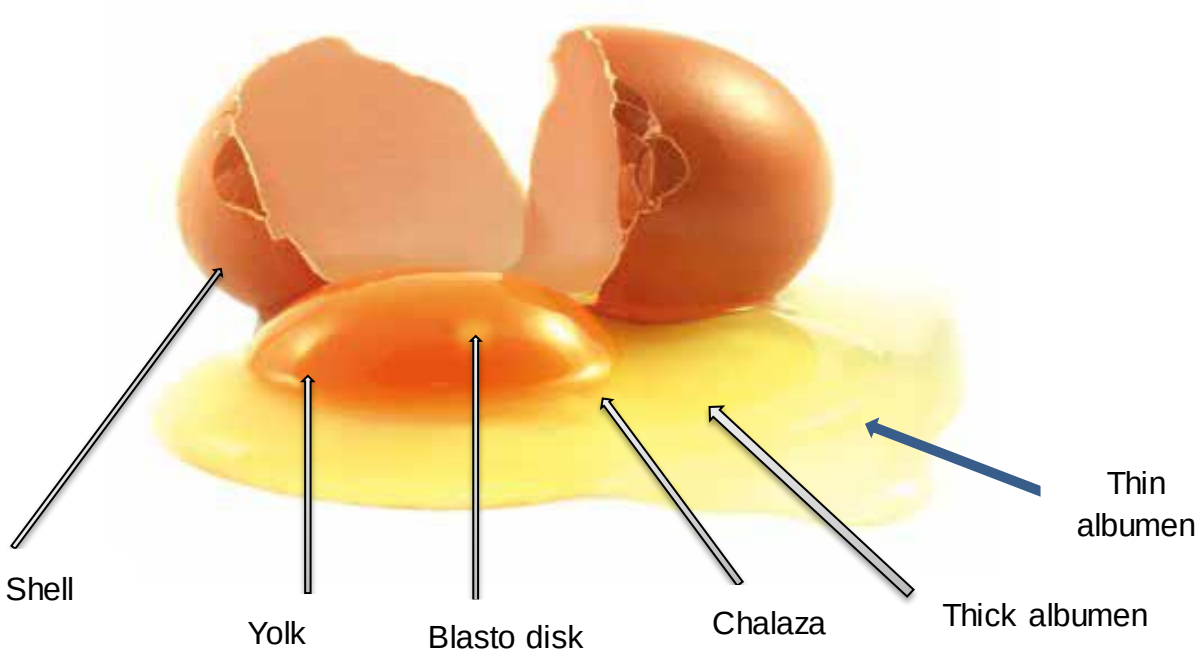

Figure 15. Structure of egg

2) Egg Size

Shape and weight are two important dimensions of eggs. Eggs have a typical oval shape that may become slightly more elongated over the laying cycle as a result of the weakening of the muscle tone of the uterus (also known as shell gland). Stress during the early stages of the shell formation can also affect the shape of eggs and create grooves and ridges. Occasionally, hens can lay abnormally large eggs (very often double-yolk eggs) or very small and rounded eggs (often lacking albumen). Large eggs are laid by older flocks, while small eggs are often seen with younger flocks. The weight of eggs depends mainly on factors related to the hens (genetics and age) and nutrition during the laying period. Egg weight increases with the age of birds and with higher level of proteins in the ration, with an extra 1g of protein consumed per day translating into an average increase of 1.4g in egg weight. Sudden drops in feed consumption will

lead to lower egg weight. Egg weight is used in many countries to grade and sell the eggs with a premium obtained for a particular targeted weight.

3) Shell quality: appearance and cleanness

The eggshell will be typically clean and smooth throughout its surface and uniform in color. Its appearance has a strong marketing appeal in many countries. Eggs can become dirty with feces, blood, and egg content or feed. Eggs stained with blood are more often seen in younger hens as a result of a prolapse. The surface of the shell may present some small protrusions, indentations or areas of granular calcareous deposit. Conversely, the eggs can also present a very soft shell or no shell at all. These defects are often caused by the structural disruption of the shell membranes where mineralization is initiated, by a lack of mineralization due to calcium absorption, mobilization or deposition issues or the time spent in the uterus. Eggs are typically white, brown or light brown/cream although the shell may also be tinged with other colors like blue or green. The color of the shell is a reflection of the breed, age and the health status of the laying hens.

It is not modified by the type of feed given to birds. Since the same amount of pigments are deposited on the cuticle regardless of the size of the eggs, larger brown eggs will have a slightly lighter tinge than small ones. Visual inspection and automated equipment easily identifies the eggs with defective appearance and cleanness. Healthy hens, good nutrition and good husbandry practices mitigate many of the causes of dirty eggs

Shell quality: thickness and strength

The quality of the shell is important to ensure the profitability and sustainability of egg production. The shell, formed by the precipitation of calcium carbonate onto the eggshell membranes, requires about 2.3g of calcium which the hen must obtain from the diet as well as from the medullary bone. For both the absorption from the intestine and the mobilization from the bones, the hen requires high levels of 1,25 (OH)2 vitamin D3 in its blood. Therefore, in addition to the right amount and presentation form of calcium in the diet, hens must also be provided with the appropriate level and form of

vitamin D3. The dietary provision of 25(OH) D3 will allow for a higher plasma level of the metabolite and therefore a better Ca absorption. The shell is about 300-400 micrometers in thickness and can withstand a breaking force of at least 30 Newtons. Shell thickness and strength tend to decrease with the age of the hens if the egg size increases (more cracked eggs) but the right balance of vitamin D3 and calcium (in coarse form) will protect over time the integrity of the shell. Manual candling and automated systems can detect cracks and small shell defects.

Egg freshness: albumen

Thick albumen accounts for about 60% of the albumen in freshly laid eggs. As the albumen contains a large amount of carbon dioxide, its pH ranges from 5.6 to 7.5 with time and gas exchanges with the outside environment. When the carbon dioxide dissipates, the pH of the albumen rises to about 9.5. This rise in pH will affect the structure of ovomucin - a glycoprotein found in larger proportion in the thick albumen - and will make the albumen lose its viscosity. The percentage of thick albumen - a reflection of the quality of the albumen - decreases with storage time, and more rapidly at higher temperatures. A visual inspection of the albumen after breaking can provide a good indication of the freshness of the egg.

Egg freshness: yolk

Shape and color are the two main characteristics to evaluate the quality of the yolk. In a fresh egg, the yolk is nearly spherical and stands high with little change in shape once the egg is broken onto a flat surface. The yolk index, defined as the ratio of yolk height over yolk diameter, provides indication on the freshness of the egg. Eggs with yolk index above 0.38 are considered as extra fresh. Those ranging from 0.28 to 0.38 are fresh and those below 0.28 are considered regular. The yolk index will decrease during storage, although less when eggs are kept under refrigeration as shown below: In addition to detecting defects like blood spots at the surface of the yolk, the candling of eggs also provides some information on freshness. During candling, the yolk creates a shadow that is light in fresh eggs as the thick albumen and chalaza keep the yolk in a

central position. With time, the albumen becomes thinner and the yolk, moving closer to the shell upon rotating the egg, creates a darker shadow.

Testing Egg for Freshness

The Sink or Float Test

A science experiment may have done in school, this freshness test is not only simple but also can tell the approximate age of the egg.

Materials

- Egg,
- Bowl, and
- Cold water.

1). Fill the bowl with enough cold water to completely cover the egg, then gently drop the egg into the bowl of water.

2. Egg can do one of three things and each will determine its freshness. If it sinks to the bottom, turns on its side, and stays there, it is very fresh.
3. If the egg sinks but floats at an angle or stands on end, the egg is a bit older (a week to two weeks old) but still okay to eat.
4. If the egg floats, it's too old and should be discarded. (If you are looking for more of a cut-and-dry test, dissolve 2 tablespoons of salt in 2 cups of cold water. Put the egg in the water if it sinks, it's good; if it floats, it's too old.)

The science behind this is that as eggs age, the shell becomes more porous, allowing air to flow through. The more air entering through the shell, the larger the air cell becomes (the pocket of air between the membrane and shell in the larger end of the egg). The air sac, when large enough, makes the egg float.

The Egg White Test

This test is a good choice if to plan on cracking the egg before cooking it or adding to a baked good recipe. Crack the egg onto a plate or other flat surface and look closely at the consistency of the egg white it should be slightly opaque, not spread out too much, and appear thick and somewhat sticky. If it is watery, clear, and runny, the egg has lost its freshness. This is due to the fact that as eggs age, the white turns liquidy and breaks down. You will also notice the yolk will be slightly flat on top instead of rounded.

Yolk index of edible eggs

The yolk index, defined as the ratio of yolk height over yolk diameter, provides indication on the freshness of the egg. Eggs with yolk index above 0.38 are considered as extra fresh. Those ranging from 0.28 to 0.38 are fresh and those below 0.28 are considered regular. The yolk index will decrease during storage, although less when eggs are kept under refrigeration as shown below:

Yolk index is calculated by dividing the height of the yolk by the average diameter of the yolk, as follows:

Procedure

1. Place the egg contents on a flat surface
2. Using a digital caliper, measure the first diameter (D1)
3. Turn the caliper 90˚ and measure diameter 2 (D2)
4. Pierce the yolk with the stem of the caliper and measure the height (H)
5. Calculation: Yolk Index = (Hx2)/D1 + D2

In addition to detecting defects like blood spots at the surface of the yolk, the candling of eggs also provides some information on freshness. During candling, the yolk creates a shadow that is light in fresh eggs as the thick albumen and chalaza keep the yolk in a central position. With time, the albumen becomes thinner and the yolk, moving closer to the shell upon rotating the egg, creates a darker shadow.

Yolk evaluation: color

In addition to water, lipids and proteins, the yolk contains carotenoids which are responsible for the color of the yolk. As the hens cannot synthesize them, all carotenoids present in the yolk come from the rations fed to laying hens. Rations containing yellow corn, corn gluten meal, lucerne, xanthophyll-rich ingredients like flower (marigold), plant (paprika) extracts or specialty ingredients like carophyll will supply more carotenoids than wheat-based rations. Therefore, the color, intensity, shade and homogeneity of the yolk is dependent on the rations fed to hens and their ability to properly absorb and deposit carotenoids in the yolk. In many countries, consumers prefer a nice, golden yolk and egg producers must ensure that they consistently meet these expectations by monitoring the intensity of the yolk color and adjusting the formulation of the rations fed to laying hens accordingly.

Nutritive value of eggs

Eggs are one of the most known and accepted foods by consumers around the world. They are widely recognized as a source of high quality proteins, several fat-soluble vitamins (for example vitamins A, D and E), and water-soluble vitamins (for example vitamin B12, riboflavin and folate) as well as a number of micronutrients (for example Iodine, Iron, Phosphorus and Selenium). The quality of proteins is based on their amino acid composition and digestibility. Eggs provide the best profile for essential amino acids; the protein-building blocks which humans cannot synthesize and must find in their diets. Combined with a digestibility of 98%, cooked eggs have the highest biological value of any single food protein. Eggs are categorized as a low energy, nutrient-dose food that contribute to the human diet at all stages of life. One egg provides 6g of high quality protein and it's a good source of riboflavin, B12 and Folate. Moreover, eggs are an ideal vehicle for the delivery of specific nutrients like vitamins, carotenoids, minerals and fatty acids to increase the value proposition of eggs towards specific consumer groups.

Egg Evaluation Card

The egg quality score card below is provided as a guideline for monitoring egg quality. Expected values are derived from a database of a flock at peak and optimum production.

Table 6. Egg quality score card table

	Average	**Range (Min-Max)**	**Minimum acceptable**
Egg Weight (g)	60	30-85	Depends on market
Shell breaking strength (kgf)	4.2	1-7.5	3-3.2 depending on strain, hen age and size
Shell thickness (mm)	0.4	0.20-0.57	0.3
	Values	**Observation**	
Yolk color			
Yolk index Regular eggs Fresh eggs Extra fresh eggs	<0.28 0.29 - 0.38 >0.38	Reliable indicator of freshness. It decreases with storage time and temperature	
Thick albumen height (mm)	**3-10**	Decreases with storage times and temperature	
Meat/Blood spots	**Y/N**	Absence of Meat/blood spots should be observed	

3.2. Egg collection Handling and Grading System

Egg Collection and Handling

Regardless of on-line or off-line processing, steps are taken to maintain egg quality on the farm. These include, but are not limited to, egg collection occurring several times daily, careful egg handling procedures, egg cooling, egg cleaning, and use of clean packaging materials. Eggs are moved using conveyor systems between the production facility and the processing plant. The processing machinery is fully mechanical and most of the equipment on commercial farms works to wash, dry, sort by weight and quality, and package the eggs into specified packaging. Once eggs are consolidated to pallets, fork lifts are used to handle the product. Egg collection equipment should be made of materials that are non-toxic and be designed, constructed, installed, maintained and used in a manner to facilitate good hygiene practices. It is not possible to maintain high quality of egg without proper handling.

Egg should be gathered at least three times per day. The exact time vary according to the rate of lay and season of the year. A suggested schedule for gathering time is 9:30 a.m. noon and 4:30 p.m. Always eggs should be gathered in a wire basket.

After collection of eggs from layer house following steps should be followed:

- Eggs should be collected in coated wire baskets or plastic container to facilitate cleaning and disinfection. Metal containers are not generally used to avoid rust.
- Eggs should not be stacked too high to avoid breakage. These should be washed properly as soon as possible aiter collection. This reduces the chances of contamination and loss of interior qualities.
- For cleaning of dirty eggs, mild detergent call be used.
- Eggs should be washed with little warmer water so that egg contents swell and push the dirt away from the pores.
- Eggs should not be cooled before cleaning because egg shell may contract and pull any contaminate from the surface to pores during cooling. After washing, eggs are cooled and dried.

- Eggs should be stored as large end up. Eggs should not be kept in a place close to or lions, potatoes, and apples. Kerosene or strong odour of any kind because eggs absorb odour during storage.

Egg Collection Chart Month_____

Table 7. Egg collection chart

Day Of Month	# Of Eggs		Day Of Month	# Of Eggs
1.			**16.**	
2.			**17.**	
3.			**18.**	
4			**19.**	
5.			**20.**	
6.			**21.**	
7.			**22.**	
8.			**23.**	
9.			**24.**	
10			**25.**	
11.			**26.**	
12.			**27.**	
13.			**28.**	
14.			**29.**	
15.			**30.**	

Care and Handling

Rough handling of the eggs not only increases the risk of breaking the eggs, but also may cause internal egg quality problems. If the egg is properly handled during shipment and distribution, it will reach the consumer's table with adequate freshness.

Storage of eggs are very prone to take on the odours of other products stored with them; separate storage is therefore advised. Storage above 15.5 °C increases humidity

losses. High relative humidity (RH) helps to decrease egg water losses. Storage at an RH above 70% helps to reduce egg weight losses and keeps the albumen fresh for longer periods of time.

Refrigeration

Eggs must be cooled to a core temperature of 45 ˚F (70c). Eggs held prior to processing must also be cooled. All eggs being transported must be hauled in a refrigerated trailer so that the core temperature is held constant at 45˚F (70c).

Storage of Eggs

1) Store eggs small end down in an egg carton to keep the air cell stable.
2) Date carton so you can use or sell the oldest eggs first and rotate your extra eggs. Try to use or sell all eggs before they are three weeks old.
3) Store eggs at 50-55ºF and 70-75% relative humidity.
4) Never store eggs with materials that have an odour. Eggs will pick up the odours of apples, fish, onions, potatoes and other food or chemicals with distinct odours.
5) Never hold eggs at or above room temperature or at low humidity more than necessary.
6) Leaving eggs in a warm, dry environment will cause interior quality to drop quickly.

Egg Grading

Quality is the sum of the characteristics of given food item which influences the acceptability or preference by the consumer. Grades are used to classify a commodity into different levels or ranges of quality such as good, better, best or C, B and A grades. Standard is the description of one or more characteristics of food which divide those in the market into two or more groups called grade. Grades are based on standards. Grading is a form of quality control used to divide a variable commodity or product into a number of classes. The United States Department of Agriculture (USDA) standards for quality of individual shell eggs were developed on the basis of both interior and exterior quality factors. Commercially, eggs are graded simultaneously for exterior and interior quality. Internal quality factors can also be determined by candling. Candling involves

holding the egg to a concentrated light source for visual inspection of internal defects, such as blood spots or double yolks. Egg grading is also dependent upon external quality factors (e.g., shape, texture, cleanliness, and soundness of the shell). An egg with a AA grade contains the most desirable characteristics while an egg with a B grade contains the least desirable characteristics. External quality can be determined by candling for illumination and detection of egg shell cracks. When determining the grade of an egg, the factor with the lowest grade will determine the overall grade of the egg. In the United States, egg grades include AA quality, A quality, B quality, and dirty. Only AA and A quality eggs are sold for supermarkets.

Candling of Egg

The commercial method of determining the interior and exterior quality of a shell egg is by candling. This method involves:

1. Holding the egg before a suitable light at about elbow level with the air cell upward.
2. Giving a quick twist in order to start the contents whirling. This makes the interior of the egg visible and the exterior of the egg more visible. This helps to see the condition of the shell, the size of the air cell and whether the yolk is well centered (a sign that the white is thick, as it holds the yolk in position). 'Thus it makes air cell, egg white, yolk, blood spots and other contents easier to distinguish

During candling, the shell is examined for porosity, cracks and cleanliness. If there is any white line on the shell, then there is a cracked egg. Cracked eggs should not be stored but consumed as soon as possible or discarded. The size of air cell should be checked. The distance between top and bottom of the air cell, when the egg is held with air cell up, is measured as depth of the air cell. In a fresh egg, air cell is small and not more than 1 /8" inch deep. With the aging of the egg, air cell becomes larger due to evaporation and the egg is considered as low grade. The condition of albumen, its viscosity, presence of meat and blood spot is also visualized. Commercially, candling by flush candling and grading according to size weight are done together followed by oil spraying on shell eggs. Grading generally involves the sorting of products to quality, size, weight and other factor that determine the relative value of the product.

Advantages of grading and standardization:

- Provide uniform categories - is of economic importance to interstate and foreign trade.
- Give assurance of quality.
- Personal inspection is not necessary.
- A basis for settling disputes involving quality.

Quality Factors in Grading of Egg

The various interior and exterior quality factors used in grading eggs are as follows:

Interior quality

- **Condition of the yolk:** Visibility of yolk, ease of its movement and shape are examined. In fresh egg, yolk is in the centre of the egg compared to old eggs. Presence of any **blood spot or meat spot** is also examined.
- **Condition of the albumen:** Albumen should be thick and firm in fresh eggs.
- **Condition of the air cell:** Air cell size is small in fresh egg and it increases with time of storage.

Exterior quality

- **Soundness of the shell:** Shell may be broken, dented or may have cracks.
- **Cleanliness of the shell:** It has consumer appeal. Shell should be free from any visible dirt.
- **Size:** Eggs may be of jumbo size, extra-large, large, medium, small, peewee size.
- **Shape and texture of the shell:** Visual inspection reveals mis-shaped, rough or thin- shelled eggs.
- **Colour of the shell:** It has consumer's preference. Brown shell are preferred than white shell but it has no significance in quality. Shell color may vary from white to brown, depending upon the breed of the hen.

Self-Check 3 – Written Test

Name_____ **ID**_____ **Date**_____

Directions: Answer all the questions listed below 3 point each. Examples may be necessary to aid some explanations/answers.

Test I. Write true if the statement is correct/False if it is incorrect for the following questions (3 points each).

1. Poor egg shell quality or inconsistent yolk color will have serious financial consequences.
2. Thick albumen accounts for about 40% of the albumen in freshly laid eggs.
3. Quality is the sum of the characteristics of given food item which influences the acceptability or preference by the consumer.
4. The yolk index, defined as the ratio of yolk height over yolk diameter, provides indication on the freshness of the egg

Test III. Choose the best answer for the following questions (2 point).

1. Of the following which one is determine the quality of egg?

A. Egg shell
B. Albumen
C. Egg yolk D. All of the above

Test III. Short Answer Questions (10 points).

1. Describe and discuss the interior and exterior quality parameter of egg.

Note: Satisfactory rating - 12 points Unsatisfactory - below 12 points

You can ask your teacher for copy of correct answers

4.1. Quality Assessment of Honey

Honey quality: It does not matter where they are living – in their own nest built in the wild or in any type of hive – bees always store clean and perfect honey. The place where they live has no effect upon the quality of honey that bees make. It is only subsequent handling by humans that leads to reduction in quality; if the honey is harvested when the water content is still too high (honey is still 'unripe'), if it is contaminated, over-heated, over-filtered or spoiled in any other way. Quality – according to the consumer. For the consumer of honey, the important features of honey are its aroma, flavour, colour and consistency, all of which depend upon the species of plants being visited by the bees. For example, bees foraging on sunflower will produce a golden honey that granulates (crystallises) quite quickly, while bees foraging on avocado produce a dark honey that remains liquid over a long period. The factors of aroma and flavour of honey are subjective, and honey is often judged according to its colour. Usually dark-coloured honeys have a strong flavour while pale honeys have a more delicate flavour. A great number of different substances (alcohols, aldehydes, organic acids, and esters) contribute to the flavour of honey. These are volatile compounds and evaporate easily at temperatures above 35 C: this is one of the reasons why honey quality is reduced by heat.

It is impossible to give a comparable value to the subjective values of flavour and aroma: the relative popularity of dark and light coloured honey varies from country to country. Colour can sometimes be a useful indicator of quality because honey becomes darker during storage, and heating will darken honey. However, many perfectly fresh, unheated and uncontaminated honeys can be very dark

Natural bee honey has been the subject of research for several decades. However, it still surprises scientists with its diversity, nutritional, prophylactic, and biological activity. Therefore, techniques that enable the assessment of its quality are continually modified

and improved with the aim of reducing analysis time, eliminating expensive and harmful reagents, decreasing workload, and increasing accuracy.

Honey Quality parameters

- Color.
- Moisture content and water activity.
- Sugar content.
- HMF content
- Electrical conductivity.
- Protein and pollen content
- Enzymatic activity.
- Microbiological count.
- Antioxidant activity.
- Aroma compounds.

Figure 16. Different type of Honey

1) Variety of Honey

The melissopalynological method is the principal technique used to determine the variety of bee honey. This technique enables determination of the share of predominant pollen grains in a particular honey, on the basis of which the honey variety is named, with the name derived from the botanical name of the plant or plants. The method also allows for identification of adulterated honeys. The melissopalynological method was developed in 1895 by Pfister. It has been improved since then and is currently the most

widely used technique for correct determination of honey variety. Beekeepers, however, determine the variety of honey on the basis of its organoleptic characteristics and observations from which plants bees collect nectar. The measurement is performed using the polarimetric method and dierences between honey types are due to their carbohydrate composition. A number of researchers are seeking techniques that will not be as difficult and time-consuming to perform as the melissopalynological method. One of the newest approaches to identifying honey varieties uses an electronic tongue. An electronic tongue is a modern device which can be used to distinguish between honey samples.

2) Sugars

The carbohydrate composition of natural bee honey may be one of the key factors in establishing its botanical origin and, indirectly, enabling its proper classification Sugars in honey are produced by enzymatic sucrose hydrolysis and transglycosylation

3) Water

The harvesting of unripe honey will result in it having too high a water content. This will cause faster fermentation as a result of microbial development, including Zygosaccharomyces. Water, by collecting in higher layers of honey causes thinning, followed by foaming, an acidic smell, and a characteristic taste. On the other hand, yeast from the genus Torulopsis cause fermentation which is manifested, for example, by honey leaking from its packaging. The susceptibility of honey to the development of microorganisms increases in samples with a water content above 17%. Moisture content in honey is measured by refractometers. This parameter is determined in honey melted at 50 ^{0}C and then cooled to room temperature. The principle of this method is founded on measurement of the refractive index, based on which water content in honey is determined. The higher the solids content, the higher the refractive index. Enzymes: Diastase and Invertase Enzymes present in honey include invertase, amylases, maltase, phosphatases, catalase, glucose oxidase, fructofuranosidase, and ascorbinoxidases. What is particularly important in regard to enzymes, their content in bee honey is influenced by, among others, storage conditions (including high

temperatures), and decrystallization process. Determination is performed by spectrophotometric reading at 620 nm. The result is expressed in units of Schade/g honey. Good quality honey should have no less than 8 Schade units/gram (except baker's honey).

4) pH and Free Acidity

Organic acids, present in bee honey, are the key factor responsible for its taste. Among the most common organic acids are citric and gluconic acid, as well as succinic, malic, butyric, lactic, formic, acetic, and pyroglutamic acids. These acids a ect the overall acidity of honey (called titration). The negative logarithm of hydrogen ion concentration is pH, while free acidity is the sum of all free acids present in honey. The principle of the method is based on the dissolution of bee honey in water, pH measurement, followed by titration with sodium hydroxide solution (0.1 M) to obtain a pH of 8.3. Free acidity should be no be more than 50 mill equivalents/kg of honey with the exception of baker's honey (the norm: no more than 80 mill equivalents/kg). Acidity level and water content in honey are parameters that aect the development of yeast and mold in this bee product.

5) Ash and Elements

Mineral substances, amino acids, and organic acids (e.g., citric acid), present in bee honeys, form ionic forms in honey aqueous solutions, which consequently a ects the conduction of electrical current and the measurable parameter referred to as electrical conductivity. Minerals, after burning honey, remain as ash Determining ash content is helpful in assessing the type of honey. Ash is the residue after burning a sample at 350 - 400 ^{0}C, for at least 1 h, repeated until a constant weight is obtained. Its amount is expressed in g/100 g.

Honey quality Testing

1) The Thumb Test

One of the easiest honey adulteration tests wherein all need to do is – put a small drop of honey on thumb and wait. If it's pure, it won't spread and spill out, and if it does, then it's likely adulterated.

2) The Vinegar Test

Another simple chemical test for the identification of honey involves vinegar. In this test, need to mix 2 – 3 teaspoons of vinegar in one tablespoon of honey along with some water. The formation of mixture indicates adulteration, which isn't the case if no mixture gets formed.

3) The Flame Test:

Dip a dry matchstick in honey and try lighting it. If it lights up easily, it means that the honey is pure, however, if it doesn't light up, it's a clear indication of having moisture or adulterants in the honey.

4) **The Blot Test**

This test is beneficial in checking whether the given honey is diluted with water or not. Here, you need to put a few drops of honey on an efficient blotting paper. While neither of the honey will get absorbed into the paper, the diluted one will leave a wet mark around it. So you will know that it has some water content. Apart from these, can also conduct the water test for honey analysis at home. In that, simply need to put a few spoons of honey in a glass of water. If the honey is pure, it will settle at the bottom of the glass. Otherwise, it will dissolve in the water. One thing need to remember here is that none of these tests is 100% accurate

4.2. Honey Harvesting and Handling

The harvest of honey should not be accomplished in rainy days or when the relative humidity is high, because this would lead to an increased moisture indexes in the honey. The beekeeper should decide for those hours which there is less air humidity on the sunny days. When harvesting, the eekeeper should not throw directly on the honeycombs, this should be performed at small amounts, by using the bee smoker far away from the frames of honeycombs. These procedures are followed in order to reduce the incorporation of the smokeable smell into both honey and beeswax, as well as detritus from the bee smoker. After harvesting, the frames of honeycombs should not stay exposed to the sun for long periods because high temperatures can lead to the increased hydroxymetyfurfural content (HMF) in the honey, reduced content of the main enzymes in honey (invertase, glucose oxidase and diastase), therefore endangering the honey quality.

Many methods are available to separate bees from their honeycombs can be taken out one at a time and bees may be removed by shaking and brushing. Whole supers can be cleared of bees with strong air blower. An inner cover or special board with a one way bee escape can be placed below the honey super. Up to one deep, or two shallow supers, can thus be cleared in 24 hours, if enough space is available below. This method cannot be recommended if colonies are sitting unprotected in the sun, which might melt the combs in the now unventilated supers. None of these three methods will contaminate the harvested honey, the use of unpleasant smelling chemicals to drive bees away is a technique preferred by many beekeepers because it is quick and easy.

In order to avoid contamination the honeycombs should not be directly placed on the ground. The beekeeper should place them directly in a special transporting barrow, from which the base is preferentially a stainless steel tray or other material appropriate for food. They should be covered on such a way to avoid pillage, mainly at the end of nectar season.

The relative importance of each factor is expressed numerically on the scale of 100. The maximum number of points that may be given each factor is:

Table 8. Maximum points given to the factor of honey grading

Factors	Points
Flavor and aroma	50
Absence of defects	40
Clarity	10
Total Score	100

4.2. Honey Grading

Judging honey is not like evaluating other commodities. The product itself is not examined so much as the care the exhibitor takes in putting it up for show. Criteria in grudging livestock include conformation, weight distribution and behavior. The knowledge to expertly judge livestock is acquired only after a great deal of experience and specialized training. But not so with honey, a product that is infinitely variable because of differences in floral source

Honey Grading Standard

A grading system for extracted honey that provides general standards for two types of honey;

Filtered Honey: all or most of the fine particles, pollen grains, air bubbles, or other materials normally found in suspension, have been removed.

Strained Honey: strained to the extent that most of the particles, including comb, propolis, or other defects normally found in honey, have been removed. Grains of pollen, small air bubbles, and very fine particles would not normally be removed.

a) **Grade A** is the quality of extracted honey that meets the applicable requirements and has a minimum total score of 90 points.

b) Grade B is the quality of extracted honey that meets the applicable requirements of Table A and has a minimum total score of 80 points.

c) Grade C is the quality of extracted honey that meets the applicable requirements of Table 8 and has a minimum total score of 70 points.

Self-Check 4 – Written Test

Name_____ **ID**_____ **Date**_____

Directions: Answer all the questions listed below 3 point each. Examples may be necessary to aid some explanations/answers.

Test I. Write true if the statement is correct/False if it is incorrect for the following questions (2 points each).

1. Organic acids, present in bee honey, are the key factor responsible for its taste.
2. Judging honey is like evaluating other commodities.
3. Color indicates the strength of the flavor of the honey.

Test II. Choose the best answer for the following questions.

1. Which one is quality parameter of honey?

A. Moisture content and water activity.
B. Sugar content.
C. HMF content D. All

Test III. Short Answer Questions

1. Briefly discuss about honey grading.

Note: Satisfactory rating – 4 points Unsatisfactory - below 4 points

You can ask your teacher for copy of correct answers

Information 5 - Record and Interpret Results

5.1. Introduction

Records provide evidence that the activities were performed. They detail when the activities were done, who performed them and what happened when they were done. Clinical laboratory test results are a very important parameter in diagnosis, monitoring and screening. 70-80% of decision in diagnosis are based on laboratory results and more laboratory analyses are required. Thus a lot of data are provided and it is therefore imperative for patient care and safety that the clinicians are familiar with the test and with interpretations of the results. The laboratory result must be interpreted on the background of a reference interval that is used to distinguish between health and disease. The clinician must also evaluate the result from the knowledge of biological variation and be aware of the potential risk of false interpretation.

Record Laboratory Results

A worksheet and/or log must be kept at each testing station or place, documenting dates and results of all patient and quality control specimens analyzed. In addition, information on specimens sent to a reference laboratory must be recorded in an accession log. After recording the final report must include patient's identification number, address of laboratory, where testing where performed, the tests performed, the test report date, the specimen source when appropriate, test results and interpretation should be recorded.

Interpret Laboratory Results

The selection of diagnostic laboratory parameters depends on greatly on the medical problem in question, but in the lab often see many different tests ordered on each single sample. Ordering to many tests in an uncritical manner will not necessary provide the clinician with more information, and it can sometimes make it even more difficult to interpret the results. Therefore, when selecting a test it is important that the clinician knows how appropriate the test is for its intended use and not least to know how reliable

the test results is. In this respect it is an important task for the laboratory to provide the necessary information about methods and test results, thereby supporting the clinician in the decision making process. A rational use of clinical biochemical analysis requires an understanding of what laboratory results actually include. Therefore, it is important to understand the following concepts:

Reasons for Ordering a Laboratory Test

There are 4 major legitimate reasons for ordering a laboratory test:

- Diagnosis (to rule in or rule out a diagnosis).
- Monitoring (e.g, the effect of drug therapy).
- Screening (e.g, for congenital hypothyroidism via neonatal thyroxine testing).
- Research (to understand the pathophysiology of a particular disease process)

Concepts should be considered while interpreting Laboratory Results

A rational use of clinical biochemical analysis requires an understanding of what laboratory results actually include.

- Reference interval
- Bias (accuracy)
- Precision
- Sensitivity
- Specificity
- Predictive value

Patient factors

The time of day, fasting, age, climate, effects of drugs, and the effects of diet may all affect test results. The characteristics of test population may also affect results. Too many misunderstandings occur from attempts to apply reference ranges from one laboratory to test results from another laboratory. Also, variations of the normal range of results affect the reported test results. This normal range in the absence the greater the degree of abnormality of the test result, the more likely that a confirmed abnormality is

significant or represents a real disorder. Most slightly abnormal results are due to pre-analytic factors

Intra-individual biological variation

An individual may differ significantly from a normal population, it is important to consider the intra-individual variation for the biochemical parameter in question. Many analytes are measured with higher or lower result, dependent of fluctuation of body fluid constituents around a homeostatic set point. Seasonal variation, biological cycles or rhythms, food intake, exercise or just the time of the day can affect the parameter to be measured. This is of course of particular interest when comparing a patient's test results with a previous one, e.g. in connection with evaluation of a treatment. When doing this, the clinician must take the biological variation into account and perform a critical evaluation of the alterations observed in the results.

Biological Variation

The biological variation for a biochemical parameter is a measure of how large an increase/decrease can be expected to contribute to the analytical variation in a normal situation. With knowledge of the intra-individual biological and analytical variation (intermediary), it is possible to determine whether you can interpret the test result as being significantly different from the patient's previous one, and the so-called critical difference can be considered.

Laboratory factors

Lab situations to consider are:

a. Instrumentation
b. Laboratory methodology for performing the tests,
c. Laboratory techniques used, the actual lab procedure may yield false-positive or false-negative results,
d. Chemicals or reagents used in the lab may be outdated or contaminated or defective,
e. Clerical errors may occur that will give wrong test results,

f. Technical errors (problems with the machines that perform some automated tests) may occur that give false results,
g. A variety of human errors in the lab may occur (mixing the wrong chemicals, wrong proportions, etc.).

Reference interval

Interpretation of a laboratory result requires that the result can be related to a relevant reference value. This can be the same patient's earlier results, if this is possible, or be done by comparing to data from a "normal" population. In the latter case, to make use of the test result a reference area for the analysis in question must be specified. A reference area is established by collecting sample material from a normal healthy population, at least 100 animals, preferably several hundred animals.

Accuracy and precision

When a sample is measured several times, it is rare to get the same results every time. Instead the results will deviate more or less depending on the precision of the measurement method. Likewise, measuring a sample by two different methods will seldom give exactly the same results, but differ more or less depending on the accuracy of the methods. Thus the two major contributions to analytical uncertainty are precision (imprecision) and accuracy (bias), each contributing with random errors and systematic errors.

Precision is defined as the degree to which replicate measurements under unchanged conditions show the same results. In the laboratory the term imprecision is more often used as the random analytical errors affecting the results.

Accuracy is defined as the degree of closeness of measurements of a quantity to its actual or accepted value.

Sensitivity and specificity

In clinical biochemistry terminology a **sensitive** method usually means that the analysis is able to measure low concentrations of the analyte while **Specificity** means the method's ability to measure the analyte itself, without interference from other substances in the testing sample. Thus the terminology here refers to the analytical sensitivity and the analytical specificity. When laboratory tests are interpreted, we talk about the clinical or diagnostic sensitivity and specificity that deal with the possibility of whether a patient has a disease or not.

The interpretation of lab results depends on the reason for which the test is requested whether it is for a diagnostic purpose or for monitoring or for screening. If the test is requested for exclusion of a diagnosis, then a highly sensitive test is required; if it is for diagnosis of a high-risk disease, then a highly specific parameter is needed. Interpretation of a laboratory result actually starts with the clinician requesting the right test for the clinical problem he/she is facing. The expectation is that the result will provide information that will support decision on the subsequent treatment. What actions are taken depends on the clinician's understanding of the laboratory result and how to respond to the information. This circle from considering a laboratory analysis to interpretation and to action is the brain-to-brain cycle.

Animal Origin Food Inspection

Inspection: Inspection refers to examination of meat/milk/egg/honey and other products for abnormalities and diseases. Hygiene may be defined as an expert supervision of milk and milk products/eggs/honey with the objectives of providing whole some food for human consumption by excluding all factors that endanger the public health

Animal foods play an important role in the diet of man. Nutritionally they are important sources of protein of good quality and excellent sources of vitamins and minerals. In addition, animal foods are in general more distinctive in flavor and texture and often more palatable than foods of vegetable origin. However, grains and their products and vegetables continue to constitute the bulk of the diets of most persons because of their lower cost.

Inspection procedure

- The format of food safety inspections is set out by the Food Standards Agency in the Food Law Code of Practice
- The frequency of inspection will depend on the public health risk posed by the business, this can vary from 6 months to 18 months.
- Scores are based on the following criteria:
    - ✓ Type of food prepared, method of handling and whether a high risk process is used (e.g. vacuum packing or cook-chill processes)
    - ✓ The number of consumers at risk and whether they are a high risk group (e.g. young children, pregnant women, the elderly or immuno-suppressed)
    - ✓ Compliance with legislation and codes of practice including hygiene controls, structural requirements and
    - ✓ Confidence in management systems such as documented food safety controls called Safer Food Better Business (SFBB).
    - ✓ Take samples, photographs and inspect records. Can detain or seize any food that suspect is unsafe.
    - ✓ If there is an imminent risk to health, may serve a hygiene emergency prohibition notice, which prevents the use of a process, premises or a

specific piece of equipment. In most cases will advise and support businesses to solve problems. However, where there are concerns that public safety is being put at risk, we will consider legal action.

Animal origin food Inspection process

1. Introduce yourselves, produce identification and explain why the inspection is being carried out (i.e. whether it is following a complaint or a routine inspection).
2. Discuss issues with the proprietor/owner/manager of the business or the person responsible for food safety on site, often referred to as the food business operator.
3. During the visit may look at the condition and structure of all of the food rooms, take temperature readings of equipment, watch food being prepared, and question staff and/or the proprietor about food handling practices and procedures.
4. Check that any paperwork relating to suppliers, temperature records, hazard analysis, cleaning schedules, refuse contracts and pest control records etc are up to date and being completed correctly.
5. Discuss the findings of the inspection, making it clear what is a legal requirement and what is a recommendation.
6. A letter detailing these requirements will be sent following the inspection with food hygiene rating score, unless this has been provided in writing at the time of the inspection.
7. A follow-up visit may be needed to check that any matters requiring attention have been suitably addressed. In some instances, may consider improvement notices, prohibitions on the business or equipment and, in some circumstances, prosecution.
8. It is vital that contact the inspecting officer (or, in their absence, our commercial services manager) if work cannot be completed within the time scale agreed. Contact details should be included on any correspondence sent to firm.

Self-Check 5 – Written Test

Name_____ **ID**_____ **Date**_____

Directions: Answer all the questions listed below 3 point each. Examples may be necessary to aid some explanations/answers.

Test I. Write true if the statement is correct/False if it is incorrect for the following questions (3 point each).

1. The laboratory result must be interpreted on the background of a reference interval that is used to distinguish between health and disease.
2. Precision is defined as the degree of closeness of measurements of a quantity to its actual or accepted value.

Test II. Choose the best answer for the following questions (2 point).

1. **Which one of the following can affect the laboratory result interpretation?**

   A. Reference interval B. Bias (accuracy)

   C. Precision D. Sensitivity E. All

Test III. Short Answer Questions (4 point).

1. Write the importance of record keeping.

Note: Satisfactory rating - 6 points Unsatisfactory - below 6 points

You can ask your teacher for copy of correct answers

Operation Sheet: 1. Lactometer or density test

Objective: Milk density test

Materials: (Gloves, Measuring cylinder 200-250ml)

Procedure:

1) First, ensure that the milk temperature is about 20°C. Hot milk should be left to cool at room temperature for at least 30 minutes. If the milk was cooled below 10°C, warm it to 40°C, and then cool it to 20°C.
2) Mix the milk sample and gently pour about 200 ml into a measuring cylinder. Slowly dip the lactometer into the milk and leave it. It will sink a little and then stop. Now take the lactometer reading just above the surface of the milk.

Operation Sheet: 2. Alcohol Test

Objective: Aseptically test the freshness of milk by using alcohol test

Materials: (Gloves, Alcohol gunner or syringe, Beaker or glass, 68% alcohol)

Procedure:

1. Put equal volumes of milk and 68% alcohol in a test tube (e.g. 2 ml of milk in 2 ml of 68% alcohol).
2. Invert the test tube several times, keep your thumb pressed tightly over the open end of the tube.
3. Examine the tube to see whether the milk has coagulated. If it has, fine particles of curd will be visible.

Operation Sheet: 3. Determination of pH of Milk using calibrated pH meter

Objective: pH determination of milk

Materials: (Gloves, Lab coat, milk sample, beaker, calibrated pH meter)

Procedure:

1. Take 50 ml of milk sample at 30°C in a 100 ml glass beaker
2. Measure the pH of milk with help of a calibrated pH meter (calibrated with a standard buffer of known pH value i.e. pH 7.0 or 9.2) by dipping the electrode in the beaker
3. Read the pH of the milk after 30 sec

Operation Sheet: 4. Determination of pH of Milk using indicator paper

Objective: pH determination of milk

Materials: (Gloves, Indicator paper strips, Lab coat, milk sample, beaker,)

Procedure:

1. Indicator paper strips are made by soaking strips of absorbent paper in a suitable indicator and drying them
2. A rough estimate of pH is obtained by dipping a strip of the prepared paper in milk and observing the colour
3. Bromocresol purple (pH range 5.2 to 6.8 – colour changes from yellow to purple) and bromothymol blue (pH range 6.0 to 7.6 – colour changes from straw-yellow to bluish-green) are commonly used as indicators
4. Both narrow and wide range ready-made indicator papers are available
5. Commercially over the pH range 2.0 to 10.5.

Operation Sheet: 5. Clot on Boiling Test

Objective: Aseptically test freshness of milk

Materials: (Gloves, lab coat, Milk sample, Spirit lamp, water bbath, bunsen burner)

Procedure:

1. Transfer 5 ml of the sample to the test tube and smell for any acidic flavour
2. Place the tube in a boiling water bath and hold for about 5 minutes, and smell again for any acidic flavour
3. Remove the tube from the water bath and rotate it in an almost horizontal position and examine the film of milk or side of the test tube for any precipitated particles
4. Alternately, take 5 ml of milk in a test tube, boil on the flame of a spirit lamp and examine the film of milk or side of the test tube for any precipitated particles

Operation Sheet: 6. California Mastitis Test

Objective: To detect unseen infection of cow

Materials: (Gloves, Lab coat, Milk sample, test tube, CMT paddle)

Procedure:

1. About ½ teaspoon (2 cc) of milk is taken from each quarter. There is the amount that would be left in the cups when the paddle is held nearly vertical, or in an upright position.
2. An equal amount of CMT reagent is added to each cup in the paddle.
3. The paddle is then rotated in a circular motion to thoroughly mix the contents. The mixing should not last more than 10 seconds.
4. The test must be "read" quickly because the visible reaction tends to disintegrate after about 20 seconds. The reaction is visually scored depending on the amount of gel that forms. The more gel, the higher the score.

Operation Sheet: 7. Measuring Yolk Index Diameter

Objective: To measure yolk index diameter

Materials: (Gloves, Egg, Digital caliper to measure yolk index, flat container)

Procedure:

1. Place the egg contents on a flat surface
2. Using a digital caliper, measure the first diameter (D1)
3. Turn the caliper 90˚ and measure diameter 2 (D2)
4. Pierce the yolk with the stem of the caliper and measure the height (H)
5. Calculation: Yolk Index = (Hx2)/D1 + D2

Operation Sheet: 8. Candling of Egg

Objective: To observe the internal quality of egg

Materials: (Gloves, Egg)

1. Holding the egg before a suitable light at about elbow level with the air cell upward.
2. Giving a quick twist in order to start the contents whirling. This makes the interior of the egg visible and the exterior of the egg more visible.

LAP TEST	

Name_____ **ID**_____ **Date** _____

Time started: _____ **Time finished:** _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 1 hour. The project is expected from each student to do it.

During your work: You can ask all the necessary tools and equipment

Lap Test Title:

1. Milk density/lactometer test
2. Alcohol Test
3. Determination of pH of Milk using calibrated pH meter
4. Determination of pH using indicator paper
5. Clot on boiling test
6. California Mastitis Test
7. Measuring Yolk Index Diameter
8. Candling of Egg

Task1. Perform lactometer/milk density test

Task 2. Perform alcohol test

Task 3. Demonstrate pH of milk using calibrated pH meter

Task 4. Demonstrate pH of milk using indicator paper

Task 5. Perform clot on boiling test

Task 6. Demonstrate California Mastitis Test

Task 7. Perform measuring of yolk index

Task 8. Perform Candling of Egg

Reference Materials

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