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Ministry of Labor and Skills

Animal Health

Level-IV

Based on March 2022, Version 4 Occupational standard



Module Title: - Carrying-out Inspection of Animal Origin Food and Veterinary Public Health Activities

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Ministry of Labor and Skills

Table of Contents

Introduction to the Module 1

LO 1- Develop knowledge of public health issues associated with food of animal origin 2

Instruction sheet 1 2

Information Sheet 1 3

Self-check 1 32

LO2- Acquire knowledge on abattoir and abattoir hygiene 35

Instruction sheet 2 35

Information Sheet 2 36

Self-Check – 2 45

LO 3 Conduct Ante mortem examination and supervise slaughtering process 44

Instruction sheet 3 44

Information Sheet 3 46

Self-Check – 3 66

Operation sheet 2 68

Lap test-1 69

LO4 Conduct post-mortem examination and follow up maintenance of cold chain 70

Instruction sheet 4 70

Information Sheet 4 72

Self-Check – 4 91

Operation sheet 2: 95

LAP test-2 96

LO5. Conduct Sampling and quality assessment for food of animal origin 97

Instruction sheet 5 97

Information Sheet 5 99

Self-Check – 5 135

Operation sheet 3 138

LAP Test 3 147

LO6 Perform community awareness on veterinary public health issues 148

Instruction sheet 6 148

Information Sheet 6 149
Self-Check – 6 154
Reference Materials 155

Introduction to the Module

This module specifies knowledge, skills and attitude required to monitor the hygiene of meat, egg, milk, other milk products and by-products and honeyfollowing organizational OHS policies and procedures. It also covers sampling and conducting examination of animal origin food, meat inspection, understanding of public health issues associated with meat consumption and carrying-out community awareness on veterinary public health issues.

LG #15	LO 1- Develop knowledge of public health issues associated with food of animal origin

Instruction sheet 1

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

- Definition and scope of public health
- Sources and preventive measures of zoonotic diseases
- Nutritional importance, quality and hygiene maintenance of food of animal origin
- Residual effect of drugs, vaccine and chemical from food of animal origin

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:

- Definite and explain Public health and its scope
- Defining Zoonotic diseases and describe source and prevention methods
- Describe Nutritional importance, quality and hygiene maintenance of food of animal origin.
- Explain residual effect of drugs, vaccine and chemical from food of animal origin

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below and try to understand what are being discussed.
3. Ask your teacher for assistance if you have hard time understanding them.
4. Read the information written in the information Sheets
5. Accomplish the Self-checks

Information Sheet 1

Introduction

In recent years there has been an increased recognition of the importance of veterinary public health which has expanded to cover a multitude of aspects related to the animal – human interface. Veterinary public health is a fundamental component of public health where the main objective is to enhance human health and well being. This objective is reflected in the currently accepted World Health Organization (WHO) definition of veterinary public health which encompasses a whole range of issues linked to the human - animal interface. The wide scope of this definition can create some difficulties in determining the precise role of veterinary public health from a practical perspective. The key components of veterinary public health are described along with the practical applications of veterinary public health.

1.1. Definition and scope of veterinary public health

Veterinary Public Health is the field of veterinary medicine that is concerned with safeguarding and improving the health of the human community as a whole by controlling diseases of animals that are communicable to humans or which affect the human food chain to the detriment of the health of the consumers. According to the WHO “Veterinary Public Health is the contribution to the complete physical, mental, and social well-beingof humans through an understanding and application of veterinary medical science. World Health Organization (WHO) defined Veterinary Public Health (VPH) as "the sum of all contributions to the physical, mental and social well-being of humans through an understanding and application of veterinary science".zoonoses are the main concern of VPH.

Veterinary Public Health (VPH) is a multidisciplinary field that encompasses various aspects animal health, human health, and environmental health. It involves the application of veterinary science to protect and improve human well-being through the understanding of zoonotic diseases, food hygiene, environmental hygiene, and biomedical research. The scope of VPH extends to controlling epidemic diseases that may impact agriculture, ensuring safe and humane

slaughter practices, and educating the public about safe food storage and cooking methods. The World Health Organization (WHO) defines VPH as "the sum of all contributions to the complete physical, mental, and social well-being of humans through an understanding and application of veterinary medical science". VPH professionals include veterinarians, physicians, environmental protectionists, public health workers, and other health and agriculture professionals

1.1.1. Role and aims of Veterinary Public Health

Veterinary public health (VPH) is a component of public health that focuses on the application of veterinary science to protect and improve the physical, mental and social well-being of humans. In several countries activities related to VPH are organized by the chief veterinary officer.

- **Role**

Conventionally veterinary public health as a topic covers the following role:

- ✓Prevention and control of Zoonotic diseases
- ✓Food and Environmental protection
- ✓Veterinary public health services
- ✓Pet-facilitated therapy
- ✓Animal monitoring for public health hazards
- ✓Educate clients and public to protect themselves from zoonotic diseases
- ✓Community services

- **Aim**

Veterinary public health is therefore devoted to the following specific aims:

- ✓ Provision of hygienically safe and nutritionally adequate animal derived food for human consumption.
- ✓ Prevention of zoonotic diseases and other occupational hazards to animalowners
- ✓ Prevention of environmental contamination from agricultural and veterinaryrelated activities.

The specific aims of Veterinary Public Health are achieved through the followingactivities:

- Prevention and control of Infectious/zoonotic diseases in animals
- proper design, sitting, construction, operation and hygiene of animal slaughter

facilities

- Inspection and quality assurance of animals, meat and fish offered for slaughter
- Ensure proper disposal of dead animals or condemned carcasses/organs after slaughter
- Ensure hygiene of milk and milk processing plants
- Prevention and control of chemical residues in food.

1.2. Sources and preventive measures of major zoonotic diseases

Introduction

Those infections and infestations shared in nature or capable of naturally transmitted between by human and lower vertebrate animals. They Are diseases that are transmitted from animal to human beings. A zoonosis (zoonotic disease or zoonoses -plural) is an infectious disease that is transmitted between species from animals to humans (or from humans to animals). Zoonotic diseases are illnesses that can be transmitted from animals to humans. These diseases can be caused by viruses, bacteria, parasites, and fungi. The Centers for Disease Control and Prevention (CDC) states that more than 6 out of every 10 known infectious diseases in people can be spread from animals, and 3 out of every 4 new or emerging infectious diseases in people come from animals

A. Sources of zoonotic disease

The most common sources of zoonotic diseases are direct contact with infected animals, indirect contact with contaminated materials such as bedding or feed bowls, airborne transmission, food borne transmission, and vector-borne transmission. To prevent the occurrence of zoonotic diseases, it is important to take adequate measures at different levels. These measures include preventing animals from becoming infected, preventing humans from becoming infected, and preventing the spread of zoonoses between animals and humans.

B. Preventive measures of zoonotic disease

Some preventive measures that can be taken to avoid zoonotic diseases include:

- Maintaining good hygiene practices such as washing hands frequently with soap and water after handling animals or their waste products.
- Avoiding contact with sick animals or animals with lesions unless gloved.
- Wearing coveralls or laboratory coats when handling animals.
- Preventing animals from becoming infected by keeping healthy animals separate from sick ones and using mosquito repellents in stables [2].
- Preventing humans from becoming infected by avoiding bites from mosquitoes, ticks, and fleas, handling food safely, and being aware of zoonotic diseases both at home and away from home

1.2.1. Most important zoonotic diseases

Zoonotic diseases are infectious diseases that can be transmitted from animals to humans. There are over 200 known types of zoonoses, and they comprise a large percentage of new and existing diseases in humans. Based on their etiology can be classified as

I) Parasitic zoonotic diseases

A) Taenia saginata/ beef tapeworm/ bovine Cysticercosis: Taeniasis is a parasitic (tapeworm) disease of the small intestine of man due to T. saginata (adult stage). Cysticercosis is the tissue infection of cattle due to larval stage or cystic stage of Saginata called Cysticercus bovis (beef tapeworm).

Source: Taeniasis and Cysticercosis are common beef meat is eaten raw or imperfectly cooked.

B) Taenia solium (pork tapeworm/ swine Cysticercosis):Taeniasis due to *T. solium* is an infection of the small intestine of man with the adult stage of the pork tapeworm. Cysticercosis is the tissue reaction with its larval or cystic stage (*Cysticercus cellulosae* / 'pork measles'), which occurs most commonly in the musculature of the pig. Predilection sites for C. cellulosae

(Cysticercosis) are heart, diaphragm, and internal masseter, tongue, neck, shoulder, intercostal and abdominal muscles. The liver, lungs, kidneys, eye and brain are less often affected.

Source: When man ingests cattle meat having cysts, larvae are liberated

Prevention and control measures

- Proper meat inspection to identify infected meat
- Proper disposal of sewage and other wastes to prevent contamination of pastures
- Construction and use of toilets/latrines
- Regular deworming of humans and cattle
- Adequate cooking/roasting of meat

C) Echinococus granulosus (Hydatid cyst): Hydatidosis due to *E. granulosus* is a serious zoonosis in which man is accidental intermediate host. *E. granulosus* is one of the smallest armed tapeworm which lives in the small intestine of dog. The definitive host of the adult stage of E. granulosus is the domestic dog and a wide range of wild carnivores. The definitive hosts will pass out in their faeces eggs which are highly resistant to environmental conditions and remain infective for a long time under favorable climates. The intermediate hosts which include domestic herbivores and a wide range of herbivores acquire infection by ingesting infective eggs

Preventive measures

- Creation of public awareness through health education,
- Meat inspection in farms and abattoirs to identify and remove affected organs so that they are not sold for human consumption,
- Periodic diagnostic testing of dogs.
- Control of livestock slaughter by centralization of slaughtering to ensure animals and carcasses are inspected,
- Efficient meat inspection and proper disposal of affected offal (e.g. disposal in properly constructed ‘condemnation pits’.)
- Dog owners to control movement of their dogs.
- Regular deworming of dogs with suitable anthelmintic e.g praziquantel
- Prevent dogs from gaining access to infected offal
- Reduction of dog numbers by elimination of stray and surplus dogs

D) Trichinella spirallis (Trichinella cyst): It is a parasite of great public health importance in which the adult worm is found in the small intestine of man, pigs, rats, dogs, cat, and other mammals. The larvae enclosed in oval cysts (lemon-shaped) with their long axis parallel to the muscle fiber. Infection results from the consumption of raw or undercooked flesh of animals containing viable encysted larvae. Source: as man may acquire the infection by eating infected pork

E) Toxoplasmosis: toxoplasmosis is an infection caused by a parasite called Toxoplasma gondii. It can affect birds, rodents, farm animals, and cats and spread to humans. The most common ways of transmission are through consuming raw or undercooked meat containing parasitic cysts, contaminated water, cat feces, unpasteurized milk or its products, and eating raw, unwashed fruits or vegetables which have been in contact with contaminated soil. To prevent toxoplasmosis, one should cook meat well and avoid eating raw or undercooked meat. Be careful while handling cat litter and do not drink untreated water. Wear gloves when gardening and wash your hands afterward. Peel or wash fruits and vegetables thoroughly before eating. Wash countertops carefully. Wash cutting boards, dishes, counters, utensils, and hands with soapy water after contact with raw meat, poultry, seafood, or unwashed fruits or vegetables. Do not drink unpasteurized goat's milk.

F) Cryptosporidiosis is an intestinal infection caused by a parasite called Cryptosporidium. It is highly contagious and can be transmitted through contact with contaminated feces. The infection is often associated with recreational swimming in pools, water parks, hot tubs, lakes, and even the ocean. The parasite can also be spread through hand-to-mouth contact.

To prevent cryptosporidiosis:

- Practice good hygiene by washing hands regularly with soap and water
- Exclude children who are sick with diarrhea from childcare settings until the diarrhea has stopped.
- Clean and sanitize toys and surfaces to prevent the spread of germs.
- Avoid swimming if you are sick with diarrhea.
- Do not swallow water while swimming.

- Take young children on bathroom breaks every 60 minutes or check their diapers regularly.
- Avoid drinking untreated water from lakes, rivers, springs, ponds, streams, or shallow wells.
- Drink commercially bottled water or boil water for at least 1 minute before using it.
- Avoid eating uncooked foods when traveling in countries where the food supply might be unsafe.
- Practice safer sex by waiting for 2 weeks after diarrhea has stopped before engaging in sexual activity.

G) **Myiasis:** is the parasitic infestation of the body of a live animal by fly larvae (maggots) that grow inside the host while feeding on its tissue. Although flies are most commonly attracted to open wounds and urine-soaked fur, some species can create an infestation even on unbroken skin. Myiasis can affect both animals and humans. The prevention and control of myiasis include practicing good hygiene, avoiding contact with flies, and taking precautions to prevent fly infestations. If you suspect you have myiasis, it is important to seek medical attention to surgically remove the parasites.

II) Bacterial Zoonotic Diseases

A) Anthrax: This is an acute bacterial infection caused by *Bacillus anthracis* that occurs frequently inherbivorous animals. However, all warm blooded animals are susceptible to varying degrees. Grazing animals are infected when foraging in areas contaminated with spores of *B. anthracis.* Human infection occurs as a result of contact with animals that have anthrax through:Butchering and skinning and Consumption of contaminated meat

Control measures

In man:

- Control of infection in animals as described below
- Prevention of contact with infected animals discharges and or products
- Environmental and personal hygiene where animals products are handled

- Prompt treatment of infected persons
- Disinfections of fur and wool with hot formaldehyde
- Vaccination of high risk groups

Animals

- Prompt diagnosis
- Vaccination in endemic areas - Animal with Bacillus anthracis
- Deep (6 feet) burial or incineration of unopened cadavers. In case of burial, the body of the animal should be covered with quicklime and then covered with soil. The grass and soil in the vicinity of the cadaver is buried and area covered with quicklime.
- Affected herds should be quarantined for 2 weeks from last case with no animal or product allowed out of the farm.
- In slaughterhouse – all operations must be halted until diagnosis is confirmed. If positive, all exposed carcasses must be destroyed and premises carefully disinfected with caustic soda within 8 hours. Animals that are confirmed to have died from anthrax before slaughter should be buried or incinerated as described, without being opened.

B) Brucellosis (contagious abortion, Bang's disease): An infection caused by bacteria of the genus Brucella. Animals acquire the disease by sexual transmission or ingestion of contaminated feed. Brucella organisms are continuously shed in milk of lactating animals, uterine exudates, aborted fetuses and fetal membranes of aborting animals.

Control and prevention in animals

- Slaughtering of serologically positive animals and vaccination of young ones
- Vaccination of all the animals in a region or country
- Implementation of effective quarantine to restrict animal movement during outbreaks.
- Hygienic disposal of aborted fetuses, placenta and uterine materials thereafter disinfection of contaminated areas.
- All animals introduced in a farm should be isolated and tested before joining the rest of the herd.

Prevention of human infection

- Pasteurization of milk and proper cooking of meat before consumption.
- Observe personal hygiene and environmental sanitation during and after milking.
- Preparation of ready-to-eat dairy products using pasteurized milk.
- Ensure proper dressing and disinfection of wounds especially those on the handsthat may come into contact with brucella organisms.
- Veterinarians should take special care when handling vaccines and treating infected animals.
- Rubber gloves and long sleeved gauntlets should be worn especially when removing retained afterbirths or handling aborted fetuses.
- Employees of the meat industry should wear protective clothing, treat and dress all wounds on hands and arms.

C) Tuberculosis: is a communicable disease of worldwide occurrence that presents itself with a respiratory problem in all animals including man. The disease is caused by organisms of the genus Mycobacterium. Humans can acquire the disease from animal sources through:

- Consumption of unpasteurized milk from infected milking animals
- Ingestion of raw and undercooked meat from infected animals
- Inhalation of contaminated aerosols
- Direct contact with materials contaminated with nose and mouth secretions ofinfected animals
- Postmortem examination of infected carcasses.

Control in human:

- General health promotion
- Active immunization with BCG vaccine
- Drug treatment
- Control of animal reservoirs
- Early diagnosis/treatment
- Rehabilitation

- Surveillance

Control In animals

- Maintain TB free herds
- Applying a test and slaughter policy: Test and slaughter positive reactors
- Pasteurization/boiling of milk before consumption
- Proper meat inspection to identify, isolate and condemn TB cases
- Proper cooking of meat before consumption

D) Salmonellosis: is an infection caused by a group of bacteria that affects the intestinal tract. The infection is usually caused by consuming raw or undercooked meat, poultry, eggs or egg products, or drinking unpasteurized milk .It is important to maintain good hygiene practices such as washing hands properly before eating and after using toilets to prevent the spread of salmonella.

E) Enterohemorrhagic Escherichia coli (EHEC): is a strain of Escherichia coli (E. coli) that causes a severe intestinal infection in humans. It is the most common strain to cause illness in people and is different from other E. coli strains because it produces a potent toxin called Shiga toxin. EHEC can be transmitted through various sources such as undercooked beef, raw (unpasteurized) milk, contaminated water, and contact with animal feces. Outbreaks have been linked to foods like spinach, lettuce, sprouts, salami, unpasteurized apple juice or cider, and well water or surface water areas frequently visited by animals. The bacteria can also be spread from person-to-person in families and in child care and other institutional care centers. To reduce the risk of an EHEC infection, it is important to:

- Cook beef thoroughly to kill any potential bacteria.
- Avoid consuming raw or undercooked meat.
- Drink pasteurized milk and avoid consuming raw milk or its products.
- Drink treated or bottled water instead of untreated water.
- Practice good hygiene by washing hands regularly with soap and water.
- Wash fruits and vegetables thoroughly before consumption.
- Avoid contact with animal feces and wash hands after handling animals.
- Follow proper food safety practices when preparing meals.

F) **Shigellosis**: also known as bacillary dysentery, is an intestinal infection caused by a group of bacteria called Shigella . Shigella bacteria are excreted in stool and can be easily spread when hygiene or sanitation is inadequate. The most common way of transmission is through the fecal-oral route, which occurs when a person ingests food or water contaminated with fecal matter containing Shigella bacteria. The disease can also be spread through direct contact with an infected person or by touching contaminated surfaces and then touching one's mouth or nose.

To prevent shigellosis:

- Practice good hygiene by washing hands regularly with soap and water.
- Wash fruits and vegetables thoroughly before consumption.
- Avoid contact with animal feces and wash hands after handling animals.
- Follow proper food safety practices when preparing meals.
- Drink treated or bottled water instead of untreated water.

III) Viral zoonotic diseases:

A) Rabies is a viral disease that affects the central nervous system of mammals, including humans. It is caused by the rabies virus and is usually transmitted through the bite of an infected animal, such as dogs, bats, raccoons, skunks, and foxes The virus infects the brain and causes inflammation, leading to symptoms such as fever, headache, muscle weakness, seizures, hallucinations, and paralysis . Once symptoms appear, rabies is almost always fatal. Prevention of rabies involves vaccination of pets and people who are at high risk of infection such as veterinarians. Avoiding contact with wild animals and washing bites and scratches for 15 minutes with soap and water may reduce the number of viral particles and prevent transmission. If you or someone you know has been bitten by an animal that may have rabies, it is important to seek medical attention immediately. Post-exposure prophylaxis (PEP) can prevent the onset of rabies if administered promptly after exposure.

B) Hepatitis: is an inflammatory condition that affects the liver. There are several types of hepatitis viruses, including hepatitis A, B, C, D, and E. Here's a brief overview of each type:

Hepatitis A (HAV): It is primarily spread through contaminated food or water that contains microscopic amounts of stool from someone who's infected. Symptoms include stomach upset, diarrhea, fever, and jaundice (yellowed skin and eyes).

Hepatitis B (HBV): It is transmitted through contact with the blood or other body fluids of an infected person. It can cause both acute and chronic infections. Symptoms may include abdominal pain, dark urine, fever, joint pain, and jaundice.

Hepatitis C (HCV): It is mainly spread through blood-to-blood contact with an infected person. Most people with acute HCV infection are asymptomatic. Chronic infection can lead to liver cirrhosis or liver cancer.

Hepatitis D (HDV): It is a rare form of hepatitis that only occurs in conjunction with hepatitis B infection. HDV is transmitted through contact with infected blood.

Hepatitis E (HEV): It is primarily transmitted through the consumption of contaminated water or food. Symptoms are similar to those of other forms of acute viral hepatitis and include jaundice, fatigue, abdominal pain, and loss of appetite.

Prevention and treatment options vary depending on the type of hepatitis. Vaccines are available for hepatitis A and B.

C) Rift Valley Fever (RVF): infectious enzootic hepatitis of cattle and sheep): A highly contagious acute infectious viral disease of ruminants (mostly sheep), cattle and goats and man transmitted by mosquitoes in which focal hepatic necrosis is a prominent feature. It causes a significant high mortality in lambs. It is a modifiable disease.

IV) Fungal zoonotic diseases

Aflatoxicosis is a worldwide mycotoxicosis caused by the infestation of crops such as peanuts, nuts, corn (maize), rice, cottonseed, and other cereals by Aspergillus flavus and Aspergillus parasiticus. These molds produce potent hepatotoxins called aflatoxins, with aflatoxin B1 being considered the most toxic. Aflatoxins are metabolized to an epoxide in the liver that binds to macromolecules, including nucleic acids. The toxic effect can include mutagenesis, carcinogenesis, teratogenesis, immunosuppressant, and liver damage with reduced protein synthesis. Aflatoxicosis can affect animals and humans.

- Avoid consuming raw or undercooked meat.

- Drink pasteurized milk and avoid consuming raw milk or its products.
- Drink treated or bottled water instead of untreated water.
- Practice good hygiene by washing hands regularly with soap and water.
- Wash fruits and vegetables thoroughly before consumption.
- Avoid contact with animal feces and wash hands after handling animals.
- Follow proper food safety practices when preparing meals.

1.3. Nutritional importance, quality and hygiene maintenance of food of animal origin

Animal foods play an important role in the diet of humans. They are an important source of protein and excellent sources of vitamins and minerals. In addition, animal foods are generally more distinctive in flavor and texture and often more palatable than foods of vegetable origin. In comparison to plant-sourced foods, ASF are considered more nutritionally dense, with high sources of energy and readily digested protein, while also containing an array of bio-available micronutrients (e.g., iron, zinc, calcium, vitamin A, vitamin B 12, riboflavin, and folate) that are difficult to obtain in adequate quantities from plant source foods alone. Animal source foods are particularly rich sources of all six of these nutrients, and relatively small amounts of these foods, added to a vegetarian diet, can substantially increase nutrient adequacy.

Hygiene maintenance is crucial when handling and preparing food of animal origin to ensure its safety and prevent the transmission of food borne illnesses. The general principles good hygiene practices of animal origin includes five keys are: “keep clean, separate raw and cooked, cook thoroughly, keep food at safe temperatures and use safe water and raw materials”. Here are some key practices for maintaining hygiene when dealing with food of animal origin:

1. Personal Hygiene:
    - Wash your hands thoroughly with soap and warm water before and after handling any animal-based food products.
    - Use disposable gloves when handling raw animal products and change them between tasks to prevent cross-contamination.
    - Avoid touching your face, hair, or any other surfaces while handling animal-based foods.

2. Storage:
    - Store animal-based foods at appropriate temperatures to prevent the growth of harmful bacteria. Follow specific storage guidelines for different types of animal products.
    - Keep raw animal products separate from cooked or ready-to-eat foods to prevent cross-contamination. Use separate containers or sealable bags.
    - Ensure that the storage areas are clean, dry, and well-ventilated.
3. Cleaning and Sanitization:
    - Clean and sanitize all utensils, cutting boards, and surfaces that come in contact with animal-based foods before and after each use.
    - Wash cutting boards, knives, and other equipment with hot, soapy water. Consider using separate cutting boards for raw animal products and cooked foods.
    - Regularly sanitize surfaces with a food-grade sanitizer to kill any remaining bacteria or pathogens.
4. Cooking and Temperature Control:
    - Cook animal-based foods thoroughly to kill bacteria and other pathogens. Follow appropriate cooking temperatures and times for different types of animal products.
    - Use a food thermometer to ensure that the internal temperature of cooked animal products reaches the recommended safe levels.
    - Avoid leaving cooked animal-based foods at room temperature for an extended period. Rapidly cool and refrigerate leftovers.
5. Cross-Contamination Prevention:
    - Prevent cross-contamination by keeping raw animal products separate from other foods, especially those that won't be cooked.
    - Use separate cutting boards, utensils, and plates for raw and cooked animal-based foods.
    - Clean and sanitize countertops, utensils, and other surfaces after they come in contact with raw animal products.
6. Proper Handling of Leftovers:
    - Store leftovers from animal-based foods promptly in clean, covered containers and refrigerate them at or below 40°F (4°C) to slow bacterial growth.

- Consume leftover animal-based foods within a safe timeframe, typically within 3-4 days, to minimize the risk of bacterial contamination.

1.4. Residual effect of drugs, vaccine and chemical from animal origin food

Residues of drugs, vaccines, and chemicals in animal origin food products have received much attention in recent years due to growing food safety and public health concerns. These residues can pose socioeconomic challenges in international trade of animal and animal products. The major public health significances of these residues include the development of antimicrobial drug resistance, hypersensitivity reactions, carcinogenicity, mutagenicity, teratogenicity, bone marrow depression, and disruption of normal intestinal flora.

Veterinary drug residues can be found in animal food products such as meat, eggs and milk, when poor practices are adopted when rearing food animals. The misuse of veterinary drugs in food-producing animals could result in deposition of drug residues in the tissues and organs. When the animal is slaughtered and processed into food, or when it produces eggs or milk, these residues enter the food chain. The presence of residues of antimicrobials in food of animal origin has received much attention in recent years due to growing food safety and public health concerns. The residues of antimicrobials in food can cause hypersensitivity reactions, carcinogenicity, mutagenicity, teratogenicity, bone marrow depression, and disruption of normal intestinal flora. It can also potentially lead to the development of antimicrobial drug resistant microorganisms in humans.

Antimicrobial resistance (AMR) is a serious threat to public health around the world as disease causing microbes can become resistant to antimicrobials. As a result, humans and food animals will have fewer and more limited treatment options when they are infected with antimicrobial resistant microorganisms. The World Health Organization (WHO) has identified AMR as one of the top 10 public health threats facing humanity, and launched the Global Action Plan on AMR in 2015, to spur global efforts.

It is important to note that veterinary medicines contain pharmacologically active substances that may leave residues in food from treated animals. Food may also contain residues of

pesticides and contaminants to which animals have been exposed. However, food residue levels should not harm the consumer. The use of antibiotics in aquaculture resulting in the occurrence of residues in aquaculture products and associated harmful health effects in humans requires control measures to ensure consumer protection. Regulatory actions aimed at prudent use of veterinary drugs in food-producing animals with emphasis on aquaculture for safe and wholesome food production are also reviewed. Good animal husbandry practices as well as the use of alternatives to antibiotics such as vaccination, probiotics, phage therapy, and essential oils are recommended panaceas to reducing the use of antimicrobial residues in aquaculture and consequent food safety effects.

Self-check 1	

Name_____ ID_____signature_____ date_____

Directions: Answer all the questions below accordingly.

Test I: write true for correct statement and false for incorrect one (1pt each)

1. There is an increased in recognition of the importance of veterinary public health in recent years
2. Provision of hygienically safe and nutritionally adequate animal derived food for human consumption is one of the aims of veterinary public health

Part II. Choose the best answers (1pt each)

1. Which of the following best describes veterinary public health?
   a) A field of veterinary medicine focused on animal nutrition
   b) A branch of public health concerned with the health of animals only
   c) The application of veterinary science to protect and improve human health
   d) A discipline that studies the effects of climate change on animal populations
2. What is the main objective of veterinary public health?
   a) To control diseases that affect the human food chain
   b) To promote the well-being of animals in the community
   c) To prevent environmental contamination from agricultural activities
   d) To enhance the mental and social well-being of animals
3. Which of the following is a key component of veterinary public health?
   a) Biomedical research
   b) Environmental protection
   c) Animal training techniques
   d) Horticultural practices

4. What is the definition of zoonotic diseases?
    a) Diseases transmitted from humans to animals
    b) Diseases transmitted between different animal species
    c) Diseases caused by exposure to contaminated water
    d) Diseases caused by genetic mutations in animals
5. What are the most common sources of zoonotic diseases?
    a) Airborne transmission and foodborne transmission
    b) Direct contact with infected animals and indirect contact with contaminated materials
    c) Waterborne transmission and vector-borne transmission
    d) Genetic inheritance and congenital transmission
6. Which of the following is a preventive measure for zoonotic diseases?
    a) Avoiding contact with sick animals or animals with lesions
    b) Using chemical pesticides on animals to kill disease-causing agents
    c) Consuming raw or undercooked animal products regularly
    d) Disposing of animal waste in open water bodies
7. What is one of the aims of veterinary public health?
    a) Ensuring the availability of affordable veterinary services for pet owners
    b) Promoting the use of animals in therapy for mental health patients
    c) Providing nutritionally adequate animal-derived food for human consumption
    d) Conducting biomedical research to develop new animal vaccines
8. Which zoonotic disease is caused by the pork tapeworm?
    a) Toxoplasmosis
    b) Salmonellosis
    c) Taeniasis
    d) Brucellosis
9. What is the intermediate host for Echinococcus granulosus, the causative agent of hydatid cyst?
    a) Domestic dogs
    b) Mosquitoes
    c) Cattle

d) Rodents

10. What is a preventive measure for controlling Echinococcus granulosus infection?
    a) Regular deworming of dogs
    b) Construction of proper toilets and latrines
    c) Creating public awareness through health education
    d) Periodic diagnostic testing of cattle

Test III: Short Answer Questions (2pts each)

1) Define veterinary public health and explain its significance in protecting human health.
2) List three key components of veterinary public health and briefly describe their importance.
3) Name two preventive measures for zoonotic diseases and explain how they can be implemented.
4) Provide an example of a parasitic zoonotic disease and describe its transmission and preventive measures.
5) Explain the role of meat inspection in preventing zoonotic diseases and ensuring food safety.
6) List at least 5 residual effects of drugs on public health?

Note: Satisfactory rating – 15 points **Unsatisfactory - below 15 points**

LG #16	LO2- Acquire knowledge on abattoir and abattoir hygiene

Instruction sheet 2

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

- Selection of abattoir construction site
- Standard abattoir service facilities
- Abattoir sanitation approaches and standard principles
- Concepts and application of HACCP

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:

- Select and describe sites in abattoir construction
- Mention standard abattoir service facilities to perform full activities of slaughtering process
- Consider abattoir sanitation approaches and standard principles
- Describe and explain standards to maintain abattoir hygiene and public health problems associated with unhygienic abattoir handling
- Describe and Apply concept of HACCP based on organizational guidelines standards and protocols.

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
4. Accomplish the Self-check

Information Sheet 2

Introduction

Abattoir is a slaughter house designed for the purpose of killing animals, skinning, dressing and cutting up of carcass, wrapping for sale for human consumption with cooler and freezer storage and includes indoor confinement of animals while awaiting slaughter but shall not include any cooking or process related to processing plants such as smoking, curing or the manufacturing of meat by-products or any process related to rendering plants such as the manufacture of tallow, grease, glue, fertilizer or any other inedible product. Abattoir is any premises that is approved and registered by the controlling authority in which animals are slaughtered and dressed for human consumption is called abattoir (According to Ethiopians standard ES 1116:2005).

2.1. Selection of abattoir construction site

An abattoir should be designed to ensure the flow of operations from the live animal holding area through to shipping areas. Site characteristics should be such as to minimize the impact of the development on the local community and avoid conflicts with the natural environment and planned land use in the area. When selecting the site, care should be taken to avoid undesirable soil types. Soil types subject to large expansion and contraction can adversely affect construction costs or cause serious damage to buildings. Heavy soils subject to water logging can create drainage problems and allow pools of stagnant water to form. The area should be reasonably free of dust, and of odours, smoke, ash and other such things as are sometimes produced by sawmills, oil refineries, city dumps and sewage disposal systems.

2.1.1. Objectives, design, facilities, consultation and planning of abattoir construction

- The main Objectives of Abattoir Construction includes the following
  - ✓ To produce safe, sound and wholesome meat
  - ✓ To protect the public from zoonotic diseases

- ✓ To prevent the spread of epizootics
- ✓ Protect environment from pollution
- ✓ Utilize economically slaughter house byproducts

- The design, location and layout of an export abattoir and its equipment shall facilitate
  - ✓ hygienic condition
  - ✓ Processing of meat and meat products
  - ✓ inspection or auditing during or after product
- Since specialized knowledge is required in the design and construction of a meat plant, it should be worked out in consultation with the following bodies;
  - ✓ Municipality
  - ✓ Regional or federal veterinary offices
  - ✓ Health authority
  - ✓ Architects
  - ✓ Environmental protection agency
  - ✓ Engineers worked with reputable contractors
- Planning begins with site selection and the selected area should have the following facilities;
  - ✓ Accessibility to road for transport of animals, meat and other products, and personnel
  - ✓ Availability of ample/enough freshwater supply of adequate pressure, water should be potable and fulfill international standards (water requirement in the abattoir is 454lts/day/pig, 272lts/day/bovine, 45lts/day/sheep)
  - ✓ In case potable/drink water is inadequate or absent, deep wells shall be bore holed at least 300meters radius away from waste water treatment plant
  - ✓ Facilities for sewage disposal, treatment of effluent, traps for solids: any waste treatment plant shall be at least 50 meters away from the slaughter hall, septic tanks and soak pits shall be located on lower points relative water wells
  - ✓ Availability of electricity or gas
  - ✓ Freedoms from pollution from other industries' odors, dust, smoke, ash etc.
  - ✓ Remoteness (2km away) from local housing, churches, mosques and other development to avoid complaints about noise and smell.

- ✓ Shall be away from airfields according to Civil Aviation's regulation
- ✓ Shall be 1km radius away from surface water bodies and deep wells
- ✓ Good availability of stock near by
- ✓ Sufficient size for future expansions

2.1.2. Requirements laid on Building materials

When it comes to the construction of an abattoir (slaughterhouse), there are specific requirements and guidelines that need to be followed to ensure the facility meets health, safety, and regulatory standards. Here are some requirements laid on building materials for an abattoir:

i. **Hygienic Surfaces**: Abattoirs require building materials that are easy to clean and maintain high levels of hygiene. Smooth, non-porous surfaces are preferred to prevent the accumulation of dirt, bacteria, and other contaminants. Common materials used for hygienic surfaces include stainless steel, food-grade plastics, and composite materials designed for food processing environments.

ii. **Chemical Resistance:** Building materials used in abattoirs must be resistant to the chemicals and cleaning agents used for sanitation purposes. They should not react adversely to the detergents, disinfectants, and acids commonly used in cleaning processes. Chemical-resistant coatings or finishes may be applied to surfaces for added protection.

iii. **Non-Toxicity**: The materials used in abattoirs, especially those in direct contact with the meat, should be non-toxic and food-safe to prevent contamination. This requirement applies to surfaces such as walls, floors, ceilings, countertops, and equipment. Materials should not release harmful substances or have the potential for leaching into the food products.

iv. **Durability** and Strength: Abattoir building materials should be strong and durable to withstand the demanding operations and processes involved. They must be able to withstand heavy loads, mechanical impacts, and regular cleaning without degradation or compromising structural integrity. Reinforced concrete, steel, and corrosion-resistant materials are commonly used for structural components.

v. T**hermal Resistance**: Depending on the abattoir's specific needs, building materials may need to provide thermal resistance or insulation properties. This helps regulate temperature within the facility, ensuring appropriate conditions for meat storage and processing. Insulated panels, thermal barriers, and energy-efficient materials may be used to achieve the desired thermal performance.

vi. **Slip Resistance:** Flooring materials in abattoirs should be slip-resistant to minimize the risk of accidents due to wet or slippery conditions. The flooring should provide adequate traction and have a texture or coating that reduces the chances of slips and falls. Various anti-slip flooring options, such as textured tiles or resin coatings, can be used.

vii. **Drainage** Considerations: Proper drainage is crucial in an abattoir to facilitate the efficient removal of waste fluids and prevent the buildup of waste materials. Building materials should allow for the installation of appropriate and effective drainage systems. Flooring materials should be compatible with the drainage requirements, and floor slopes should be designed to ensure proper flow of liquids toward drainage points.

viii. **Compliance with Regulations:** Abattoirs are subject to specific regulations and guidelines set by local health departments, food safety agencies, and animal welfare authorities. Building materials must comply with these regulations to ensure the facility meets the necessary standards for operation. It is important to consult with professionals experienced in abattoir construction and adhere to local regulations and guidelines when selecting building material

2.2. Standard abattoir service facilities

2.2.3. Standard export abattoir service facilities

In the sitting of inedible product departments, stockyards, effluent treatment systems and steam generating plants in relation to edible product processing facilities, the prevailing winds and terrain should be taken into account. Where coal or sawdust fired boilers or incinerators are incorporated in the complex, particular attention should be paid to the possibility of fallout from smokestacks and of dust from sawdust and coal stockpiles. The following are major parts of an ideal (export abattoir)

1. Service providing facilities

- Office
- Toilets and urinals
- Changing room and shower
- Equipment store
- Laboratory
- First aid accommodation
- Vehicle, cloth washing and ironing room
- Fire protection equipment
- Administrative buildings

2. Major Operational Facilities

When it comes to abattoirs, which are facilities where animals are slaughtered and processed for meat production, there are several major operational facilities involved. Here are some key components commonly found in abattoirs:

- **Lairage**
  - ✓ Is a place where animals are rested, feed and watered until slaughter (24 hours mostly)
  - ✓ Purpose of keeping in lairage: antemortem inspection & regain normal physiological parameters
  - ✓ The lairage comprises a ramp, holding pens, V-race, and weigh bridge
  - ✓ The floor must be impermeable and should be non-slippery material (concrete)
  - ✓ Should be divided into pens where different groups of animals can be accommodated
  - ✓ Each pen shall be constructed by considering an area of about $4m^2$, $3m^2$ and $0.75m^2$ per head of camel, cattle, and shoats, respectively
  - ✓ Each pen should have a partial roof cover, water and feeding troughs at convenient spots throughout the lairage.
  - ✓ The lairage shall be connected to the slaughter hall with animal race and should be wide enough to admit large animals but at the same time narrow enough to prevent animals turning round. A minimum width of 3m leading to a final collection pen joined by a forcing crush to the slaughter point a minimum length of 10m.
  - ✓ The width of the narrow path from lairage to stunning box shall not be greater than 90cm for cattle/camels and 35cm for shoats
  - ✓ It is believed that 24 hours rest is enough for all animals to return to normal from the stress journey; for zebu cattle 12 hour rest is sufficient and prolonged holding in a fenced concrete lairage results loss of condition. Pig can be kept for up to 48 hour

- ✓ Regular cleaning of lairage after each batch of animals is very important and should be enforced at all abattoirs
- ✓ Cleaning of lairage and washing of animals before stunning seem practical steps towards reducing bacterial contamination.
- ✓ Adequate light should be there in the lairage for inspection purposes
- ✓ Competent lairage staff to assist with the identification, movement and examination of animals should be there
- ✓ Animal warfare issues should be well addressed (herding, transport, loading, unloading, stunning, slaughtering)
- ✓ Separate (isolation pen) for isolation of sick and suspect animals should be in place and shall be constructed at least 10 meters away from the main lairage(healthy animals), and slaughter hall.

- **Foot bath**
  - ✓ A foot bath is a common feature found in abattoirs and is used to reduce the risk of cross-contamination by disinfecting the footwear of personnel and visitors before entering or leaving specific areas of the facility
  - ✓ shall be paved with concrete and be connected to the drainage system
  - ✓ shall have 90cm width, 5 meters length and 20 cm depth for cattle/camel, and 50cm width, 5 meter length and 10 cm depth for shoats
  - ✓ Disinfectant Solution: The disinfectant solution used in the foot bath should be effective in killing or neutralizing pathogens and contaminants. Common disinfectants used include quaternary ammonium compounds, chlorine-based solutions, or other approved sanitizing agents. The concentration of the disinfectant solution should be appropriate as per manufacturer guidelines or regulatory requirements.
- **Slaughter hall**
  - ✓ Is an area where all the slaughtering operations are carried out
  - ✓ Comprises stunning pen/box, bleeding area, evisceration area, carcass splitting area, and carcass inspection area, chilling and freezing area…
  - ✓ **Stunning area:** an area where food animals are stunned before being bled or sticked. In modern abattoirs animals are stunned in stunning boxes.

- ✓ **Bleeding area:** an area where bleeding takes place. There should be pressing of two drain areas; one for the collection of edible blood at the point of sticking, the other for drainage of 'drip' or inedible blood.
- ✓ Floors of slaughter hall must be of concrete or other impervious, non-slippery material resistant to wear and corrosion, with adequate drainage
- ✓ The wall shall be white and hooks used shall be rust resistant
- ✓ the slaughter hall shall be furnished with wash hand basins, pressurized water and knife sterilizing boxes
- ✓ Carcass spacing on the rail shall be 2 cattle or 5 small animals per two meters and the distance between double rails shall be spaced at least 1 meter.
  - The rails shall be 1.8 meters away from the wall of cattle/camel and 2.4m for small animals for safety operation
- ✓ Where available, water temperature for washing carcass of different species shall be 60^{o}C for 20 seconds and 82^{o}C for sterilizing equipments
- ✓ Hangers and hooks for liver, heart, lung and spleen shall be installed in the hall
- ✓ Platforms, ladders, tables, chutes and similar equipment shall be resistant to fracture, rust resistant and non absorbent

- **Slaughter hall accessories**

  - ✓ Heads and feet room
  - ✓ Hides and skin room
  - ✓ Casing-cleaning room
  - ✓ Offal preparation room
  - ✓ Detained room
  - ✓ Condemned room
  - ✓ Cutting room

- **Storage, treatment and dispatch facilities**

  - ✓ Chilling room
  - ✓ Deboning, packing and labeling area
  - ✓ Dispatch and weighing area
  - ✓ Incinerator

- **Waste, Sewage, effluent and storm water disposal system**

Human waste from toilets, showers and lavatories shall be dealt separately by collecting in a septic tank extended to soak pits. The method of disposing of any liquid, gas and solid wastes

from the establishment must be acceptable to the relevant authorities and not constitute a hazard to the overall hygiene of the premises. A letter from the relevant authority carrying a date and stating that the method of disposal is acceptable should be provided.

- **Emergency slaughter house (mini abattoir)**

An emergency slaughterhouse, also known as a mini abattoir, is a small-scale facility designed to provide temporary or immediate processing of animals in emergency situations. These facilities are typically set up to address urgent situations such as disease outbreaks, natural disasters, or any event where there is a need for rapid and localized animal slaughter.

The main purpose of an emergency slaughterhouse is to ensure the safe and humane processing of animals in times of crisis, while also addressing public health concerns and preventing the spread of diseases. These facilities are usually equipped to handle a limited number of animals and may have simplified processing operations compared to larger commercial abattoirs.



Figure 2. 1: design and facility of abattoir

2.2.4. **Standard small scale abattoir service facilities**

Small-Scale Abattoir: These abattoirs are typically designed to serve local communities or smaller regions. They usually have limited capacity and may focus on processing a specific type of livestock, such as poultry, pigs, or cattle. Small-scale abattoirs often have simpler infrastructure and equipment compared to larger facilities. Remember, maintaining abattoir hygiene is an ongoing process that requires continuous monitoring, training, and improvement. Regular audits and inspections can help identify areas for improvement and ensure compliance with hygiene standards.

In a small-scale abattoir, the facilities and equipment may be relatively simpler compared to larger industrial-scale abattoirs. However, they still need to meet certain standards to ensure food safety, animal welfare, and compliance with local regulations. Here are some common facilities you might find in a small-scale abattoir:

- Slaughtering Area: This is where animals are received and prepared for slaughter. It typically includes holding pens or lairages where animals are kept before slaughter. The area should be designed to minimize stress and ensure animal welfare.
- Killing Floor: This is the area where animals are slaughtered. It should have appropriate restraining equipment, such as a restraining box or stanchion, to securely hold the animal during the process. Equipment for stunning or killing animals should be available, depending on the specific methods used (e.g., captive bolt, electrical stunning, or manual slaughter).
- Bleeding Area: After slaughter, animals are bled to remove blood from the carcass. A dedicated bleeding area with appropriate facilities for blood collection and drainage is necessary. This area should be designed to maintain cleanliness and prevent cross-contamination.
- Carcass Processing Area: This area is used for further processing and dressing of the carcasses. It may include facilities for evisceration, skinning, and quartering the

carcasses. Adequate space and equipment for cleaning and sanitizing the carcasses are essential to maintain hygiene.

- Cold Storage: A small-scale abattoir should have refrigeration or cold storage facilities to store carcasses and meat products at appropriate temperatures. This helps to maintain product quality and prevent spoilage.
- Waste Management: Proper waste management facilities are crucial in an abattoir. This includes systems for the collection, storage, and disposal of animal by-products, such as offal, blood, and other waste materials. Compliance with local regulations regarding waste disposal is essential.
- Sanitation Facilities: Adequate sanitation facilities, such as hand-washing stations and cleaning equipment, should be available throughout the abattoir to ensure hygienic practices by workers. It is important to maintain a clean environment to prevent contamination of meat products.
- Quality Control and Inspection: Small-scale abattoirs should have provisions for quality control and inspection. This may involve dedicated areas for meat inspection, laboratory facilities for testing, and personnel trained in quality assurance procedures.

2.3. Abattoir sanitation approaches and standard principles

Abattoir sanitation refers to the practices and procedures implemented in slaughterhouses to maintain cleanliness, hygiene, and safety standards in the processing of animals for meat production. Proper sanitation is crucial in abattoirs to prevent the contamination of meat products and to safeguard public health. These approaches and principles form the foundation of abattoir sanitation. By implementing and maintaining high sanitation standards, abattoirs can produce safe and hygienic meat products while minimizing the risk of contamination and the spread of diseases. Here are some approaches and standard principles followed in abattoir sanitation:

I. **Personal Hygiene**: Strict personal hygiene practices must be followed by all staff working in the abattoir. This includes wearing clean uniforms, appropriate protective clothing (such as gloves, hairnets, and boots), and regular handwashing to prevent cross-contamination.

II. **Facility Design and Layout**: The abattoir should be designed in a way that facilitates good sanitation practices. Separate areas should be designated for different stages of processing, such as slaughtering, evisceration, and meat storage. Adequate drainage systems and proper ventilation should be in place to prevent the buildup of moisture and foul odors.

III. **Cleaning and Disinfection:** Regular and thorough cleaning and disinfection of all surfaces, equipment, and utensils are essential. Cleaning should be done using appropriate detergents and sanitizers, and a documented cleaning schedule should be followed. High-risk areas, such as cutting surfaces and processing equipment, should receive special attention.

IV. **Waste Management**: Proper management of waste and by-products is crucial in maintaining sanitation. Abattoirs should have well-designed systems for the collection, storage, and disposal of waste materials, including animal carcasses, blood, and other organic waste. These systems should comply with local regulations and be designed to prevent the attraction of pests and the spread of diseases.

V. **Pest Control**: Effective pest control measures should be implemented to prevent infestations by insects, rodents, and other pests. This includes regular inspection, use of physical barriers, proper storage of ingredients and finished products, and the application of approved pesticides or traps when necessary.

VI. **Water Quality:** High-quality water is essential for abattoir operations. Regular testing and monitoring of water sources should be conducted to ensure compliance with safety standards. Water used for processing, cleaning, and sanitizing should be of potable quality and free from contaminants.

VII. **Training and Education:** All abattoir staff should receive proper training on sanitation practices and principles. They should be educated about the importance of personal hygiene, cleaning procedures, waste management, and pest control. Ongoing training programs can help reinforce good sanitation practices and keep staff updated on the latest standards.

VIII. **Regulatory Compliance**: Abattoirs must adhere to local, national, and international regulations and standards related to sanitation and food safety. Regular inspections by regulatory authorities help ensure compliance and identify areas for improvement.

2.3. 1. Standards to maintain abattoir hygiene

Maintaining proper hygiene in an abattoir (slaughterhouse) is crucial to ensure the safety and quality of meat products and to minimize the risk of contamination. Here are some standards and practices to maintain abattoir hygiene:

I. **Standard Operating Procedures (SOPs)**: Develop and implement SOPs for all processes carried out in the abattoir. These SOPs should cover areas such as animal handling, slaughter, dressing, chilling, and waste disposal. Ensure that all staff members are trained in following these procedures.

II. **Facility Design and Layout**: Design the abattoir layout to facilitate efficient workflow and prevent cross-contamination. Separate different areas for live animals, slaughtered animals, and processing. Install proper drainage systems, adequate ventilation, and sufficient lighting to maintain a clean and safe environment.

III. **Personal Hygiene**: Emphasize the importance of personal hygiene for all staff members. Provide training on hand washing techniques, the use of protective clothing (such as gloves, boots, and hairnets), and the use of personal protective equipment (PPE) where necessary. Regularly monitor and enforce compliance with personal hygiene practices.

IV. **Cleaning and Sanitation**: Establish a robust cleaning and sanitation program. Clean and sanitize all equipment, surfaces, and utensils regularly to prevent the growth and spread of pathogens. Use appropriate cleaning agents and sanitizers recommended for meat processing facilities. Pay special attention to high-risk areas such as cutting tables, knives, and processing equipment.

V. **Quality Assurance and HACCP**: Implement a comprehensive quality assurance program, including Hazard Analysis and Critical Control Points (HACCP) principles. This system

helps identify potential hazards and establish critical control points to prevent or eliminate them.

VI. **Regulatory Compliance**: Comply with all applicable regulations and standards set by local health authorities, veterinary services, and food safety agencies. Stay updated on the latest guidelines and regulations related to abattoir hygiene and make necessary adjustments to your practices as required.

2.4. Concepts and application of HACCP

The Hazard Analysis Critical Control Point (HACCP) system is a scientific approach to process control. It is designed to prevent the occurrence of problems by assuring that controls are applied at any point in a food production system where hazardous or critical situations could occur. **Hazards** include biological, chemical, or physical contamination of food products. HCCP-answers three questions.

- What hazards can enter the product?
- Where do these hazards occur?
- How can we control eliminate these hazards?

HACCP principles and guidelines for its application

- HACCP can (should) be applied from the primary producer to the final consumer
- HACCP enhances food safety, makes better use of resources, enables more timely response to problems
- HACCP can aid official inspection and promote international trade by increasing confidence in food safety

The *"Guidelines"* provide general guidance

A. HACCP principles

- Conduct a hazard analysis
- Determine the CCPs

- Establish critical limit(s)
- Establish a monitoring system
- Establish corrective actions
- Establish verification procedures
- Establish documentation

B. HACCP guidelines has 7 Principles (1-7) and 12 guide lines

i. Assemble HACCP team: Obtain top management commitment, Appoint a leader and a secretary, Assure co-operation of experts then define scope of the study finally Set priorities

ii. Describe product: Formulation and composition Raw materials & ingredients parameters influencing safety, Processing, Packaging and Distribution

iii. Identify intended use: Specific groups of the population

iv. Construct flow diagram= Cover all steps which might have an influence on the safety of the product

v. Confirm on-site flow diagram= Check correctness of information, Check whether important information was not overlooked

vi. List all potential hazards, conduct a hazard analysis and consider control measures

Hazard Analysis: The process of collecting and interpreting information on hazards and conditions leading to their presence to decide which are significant for food safety and should be addressed in the HACCP plan.

vii. Determine CCPs= A step at which control is essential to prevent or eliminate a food safety hazard or reduce it to an acceptable level. Critical Control Points (CCPs) can be related to : Raw materials,

- Locations,
- Processes,
- Procedures,
- Practices,

viii. Establish critical limits for each CCP= Critical limits can be:

- Values of : pH, aw (water activity), temperature, & time
- Maximum residue limits
- Maximum levels (of contaminants)
- Limits in microbiological criteria
- Level of cleanliness
- Levels of chlorine, over pressure etc.

ix. . Establish a monitoring system for each CCP= the act of conducting a planned sequence of observations or measurements of control parameters to assess whether a CCP is under control. the method or equipment to be used, the moment and / or frequency of checking, the interpretation of the results and the actions to be taken.

x. Establish corrective actions

- Corrective actions should ensure that only safe products reach the consumer.
- Corrective actions: Actions to be taken when the results of monitoring at the CCP indicate a loss of control.

xi. Establish verification procedures

- Verification procedures are intended to check, the effectiveness of the HACCP system.
- Verification: The application of methods, procedures, tests and other evaluations in addition to monitoring, to determine compliance with the HACCP plan.

xii. Establish record keeping and documentation

- Minutes of HACCP study meetings, decisions made and their reasons
- Records of monitoring
- Records of verification
- Records of deviations and corrective actions
- Records of modifications to the HACCP plan

Self-Check – 2	

Name_____ ID_____signature_____ date_____

Directions: Answer all the questions up on the instruction

Test I: write true for correct statement and false for incorrect one (1pt each)

1. An abattoir should be designed to ensure the flow of operations from the live animal holding area through to shipping areas
2. Any premises that is approved and registered by the controlling authority in which animals are slaughtered and dressed for human consumption is called abattoir
3. the slaughter hall shall be furnished with wash hand basins, pressurized water and knife sterilizing boxes

Part II. Choose the best answers (1pt each)

1. One is main Objectives of Abattoir Construction includes the following
   a. To produce safe, sound and wholesome meat
   b. To protect the public from zoonotic diseases
   c. To improve the spread pollution
   d. Utilize economically slaughter house byproducts
2. The design, location and layout of an export abattoir and its equipment shall facilitate
   a. hygienic condition
   b. Processing of meat and meat products
   c. inspection or auditing during or after product
   d. all
3. in the design and construction of a meat plant, it should be worked out in consultation with
   a. Municipality and Regional or federal veterinary offices
   b. Health authority and Architects

c. Environmental protection agency
d. Engineers worked with reputable contractors
e. All

4. What is the purpose of a foot bath in an abattoir?
   a) To rest and feed animals before slaughter
   b) To disinfect footwear and reduce cross-contamination
   c) To store and treat animal by-products
   d) To provide a designated area for bleeding animals
5. Which material is commonly used for the floor in the lairage?
   a) Concrete
   b) Sawdust
   c) Asphalt
   d) Sand
6. What should be the minimum width of the narrow path from the lairage to the stunning box for cattle/camels?
   a) 90 cm
   b) 35 cm
   c) 50 cm
   d) 20 cm

PART III Short Answer Questions (2pts each)

1. List at least 5 major operational facilities in fully equipped abattoir
2. Define HACCP principles and guidelines for its application

Note: Satisfactory rating – 20points **Unsatisfactory - below 20 points**

You can ask you teacher for the copy of the correct answers.

LG #17	LO 3- Conduct Ante mortem examination and supervise slaughtering process

Instruction sheet 3

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

- OHS and hazards associated with the procedure are identified and appropriate action is taken to protect self and others
- The lairage and slaughter room are kept in clean and hygienic condition according to the enterprises requirements
- All relevant preliminary information about the animal to be examined is obtained and collated
- External assessment of the animal is carried out and outward signs of abnormalities or injury are noted
- Abnormal characteristics that may indicate the presence of notify able and potentially hazardous conditions or diseases are identified and appropriate action is taken prior to slaughter
- Judgment for slaughter is passed on the animal based on ante mortem examination guidelines and enterprise procedure
- The slaughtering process is carried out starting from stunning to carcass splitting following standard hygienic procedure under veterinarian supervision and inspection
- Offal and carcass are separated to prevent cross contamination

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 take appropriate action to *OHS* and *hazards* associated with the procedure

- Clean and Keep hygienic condition of the lairage and slaughter room according to the enterprises requirements.
- obtain and collect relevant *preliminary information* about the *animal* to be examined
- Carry out and noting External assessment of the animal and outward signs of abnormalities or injury.
- Identify and take appropriate action of *abnormal characteristics* that may indicate the presence of notify able and potentially hazardous conditions or diseases prior to slaughter.
- Pass *Judgment for slaughter* is based on ante mortem examination guidelines and enterprise procedure.
- Carry out The *slaughtering process* starting from *stunning* to carcass splitting following standard hygienic procedure and under veterinarian supervision and inspection.
- Separate Offal and carcass are to prevent cross contamination.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below and try to understand what are being discussed.
3. Ask your teacher for assistance if you have hard time understanding them.
4. Read the information written in the information Sheets
5. Accomplish the Self-checks.
6. Perform Operation Sheets
7. Do the “LAP test”

Information Sheet 3

Introduction

Ante-mortem inspection refers to the examination of animals before they are slaughtered for food consumption. It is an essential step in ensuring food safety and identifying potential health issues that could affect the quality of the meat or pose risks to human health. During ante-mortem inspection, trained veterinarians or inspectors assess the overall health and welfare of animals. They look for signs of diseases, injuries, or any other conditions that may render the animal unfit for human consumption.

3.1. OHS and hazards associated with the procedure of AMI

The ante-mortem inspection of animals, also known as pre-slaughter inspection, is an essential process in the food industry to ensure the safety and quality of meat products. Occupational health and safety (OHS) hazards can arise during this procedure, primarily for the workers involved in handling and inspecting the animals. Here are some potential OHS hazards associated with the ante-mortem inspection of animals:

a) **Animal Handling Hazards**: Workers involved in ante-mortem inspection may encounter hazards related to animal handling. This can include physical injuries resulting from animal bites, kicks, or trampling. Large or agitated animals can pose a significant risk, especially if workers are not properly trained in animal handling techniques and safety protocols.

b) **Slips, Trips, and Falls**: Slaughterhouses and livestock facilities can have slippery floors due to animal waste, blood, water, or cleaning agents. Workers performing ante-mortem inspections are at risk of slips, trips, and falls, which can lead to injuries. Adequate

housekeeping measures, non-slip flooring, and appropriate footwear can help mitigate these hazards.

c) **Equipment Hazards:** The use of specific tools and equipment during the inspection process can present hazards if not used properly. For instance, workers may use sharp knives or instruments to examine animals, which can lead to cuts or puncture wounds if mishandled. Proper training, maintenance of equipment, and the use of personal protective equipment (PPE) like cut-resistant gloves are essential to minimize these risks.

d) **Zoonotic Disease Transmission**: Ante-mortem inspection involves close contact with animals, increasing the risk of zoonotic disease transmission to workers. Some animals may carry pathogens that can cause diseases such as brucellosis, salmonellosis, or Q fever. Workers should follow strict hygiene practices, including handwashing, wearing appropriate PPE, and receiving vaccinations when necessary.

e) **Ergonomic Hazards:** Workers involved in ante-mortem inspection may perform repetitive motions, such as lifting, bending, and reaching, which can lead to musculoskeletal injuries over time. Heavy lifting, awkward postures, and prolonged standing can contribute to ergonomic hazards. Implementing ergonomic workstations, providing training on safe lifting techniques, and incorporating regular breaks can help reduce these risks.

f) **Psychological Hazards:** Working in slaughterhouses or livestock facilities can be emotionally challenging due to the nature of the work and exposure to animal suffering and death. Witnessing distressing events repeatedly can contribute to psychological stress and emotional strain. Support systems, counseling services, and regular debriefing sessions should be available to address workers' psychological well-being.

To address these hazards, it is important for employers to implement comprehensive OHS programs. These programs should include risk assessments, proper training on animal handling techniques and safety protocols, provision of appropriate PPE, regular equipment maintenance,

ergonomic considerations, and psychological support for workers. By addressing these hazards, the safety and well-being of workers involved in ante-mortem inspection can be effectively safeguarded.

3.2. Basic principles of meat inspection

The objectives of meat inspection programme are twofold: To ensure that only apparently healthy, physiologically normal animals are slaughtered for human consumption and that abnormal animals are separated and dealt with accordingly.

3.2.1. Obtaining and preparing correct clothing, equipment and resources for use

- **Working cloth hygiene**: Work clothing management must respect some specific principles
  - ✓ It is a standard type and is provided by the company.
  - ✓ It is put in a locker, physically separated from personal clothing
  - ✓ Its color, or the color of one of its elements (cap, overall), may be specific to a work station or a zone of assignment of operators.
  - ✓ It includes a cap or net which covers all hair and shoes which are only worn in the factory
  - ✓ It is laundered by the company or under its responsibility (e.g. by contract)
  - ✓ Permanent devices (boots/shoes washstands) or movable ones (trays), containing a disinfecting solution, must allow cleaning/disinfection before getting into the production zone.
- **Basic equipment required**
  - ✓ Wearing of a gown, rubber boots, gloves, and butcher's plastic vest is recommended.
  - ✓ The choice of equipment for postmortem examination depends on the size of the animal and the individual preferences of the examiner. For most purposes:

- ✓ Knives; Scissors Chopper; Bone sheerer
- ✓ Forceps - lockable type or a lifting forceps with rat toothed or serrated tips that grasp tissues without slipping.
- ✓ Metal probe- made of stainless steel, copper or bronze, or an ordinary galvanized iron wire gauge 12 and about 25-30cm long is useful in probing connections and patency of openings Mechanic hacksaw- useful for cutting bones and other hard structures.
- ✓ Butcher's steel rod or sharpening stone to keep the knives sharp.
- ✓ Weighing scales and measuring instruments like a millimeter rule and graduated cylinders or measuring cups for accurately measuring dimensions and volumes.
- ✓ Specimen bottles, one half-filled with 10% neutral buffered formalin for tissue samples.
- ✓ Sterile swabs and petri dishes for the collection of samples for microbiological examination (if required).
- ✓ Other materials that may be needed include disposable syringes and needles, glass slides, Petridish, bucket, paper toweling, garbage container and thread for tying up hollow organs
- ✓ Washing and disinfection facilities, Towel and soap

3.3. Keeping hygienic condition of the lairage and slaughter room

Maintaining hygienic conditions in the lairage (holding area for livestock before slaughter) and slaughter room is crucial to ensure food safety and prevent the spread of diseases. Here are some general guidelines that can help in maintaining hygiene in these areas:

- **Lairage:**
  - ✓ Design and Layout: Ensure that the lairage is well-designed with proper drainage systems and adequate space for animals to move comfortably. Separate areas should be designated for different species if possible.

- ✓ Cleaning and Disinfection: Regularly clean and disinfect the lairage, paying special attention to high-contact surfaces such as gates, fences, and water troughs. Use appropriate disinfectants recommended for use in livestock facilities.
- ✓ Waste Management: Properly manage animal waste by promptly removing manure and soiled bedding. Dispose of waste in designated areas to prevent contamination and odors.
- ✓ Ventilation: Maintain good ventilation in the lairage to provide fresh air and minimize the buildup of ammonia and other gases. Adequate airflow also helps control temperature and humidity, reducing stress on the animals.
- ✓ Water Supply: Provide clean and fresh water to the animals, ensuring an adequate supply at all times. Regularly clean and disinfect water troughs to prevent the growth of bacteria.

- **Slaughter Room:**
  - ✓ Facility Design: The slaughter room should be well-designed, with separate areas for different stages of the slaughtering process, including stunning, bleeding, evisceration, and carcass processing.
  - ✓ Sanitation Practices: Implement strict sanitation practices in the slaughter room. Clean and disinfect all surfaces, equipment, and utensils regularly, especially after each batch or species change. Use appropriate cleaning agents and sanitizers recommended for use in food processing areas.
  - ✓ Pest Control: Implement effective pest control measures to prevent the entry and proliferation of rodents, insects, and other pests. Regularly inspect and seal any potential entry points.
  - ✓ Personal Hygiene: Ensure that all personnel working in the slaughter room follow strict personal hygiene practices. This includes wearing appropriate protective clothing, such as gloves, aprons, and hairnets, as well as proper handwashing before and after handling animals or carcasses.

- ✓ Waste Disposal: Properly manage and dispose of animal by-products, such as offal, blood, and feathers, according to local regulations. Use designated containers and follow appropriate disposal procedures to prevent cross-contamination and the attraction of pests.

3.4. Examination of preliminary information about the animal

Preliminary information about an animal at any examination typically includes basic details such as species, age, sex, and any presenting symptoms or concerns. It may also involve a brief medical history, vaccination status, and previous treatments or surgeries. The following are the basic information should be relevant:

- Origin of the animal
- History of the animal
- Health record if available
- Previous history of treatment and vaccination
- Physiological status
- Weight
- Body condition
- Owner's name
- The number of animals in the lot and arrival time
- Species and sex of the animal
- The time and date of ante mortem inspection
- Clinical signs and body temperature if relevant
- Reason why the animal was held
- Signature of inspector

3.4.1. Carry out External assessment of the animal and outward signs of abnormalities

During ante-mortem inspection for slaughter, a veterinarian or a trained inspector assesses animals to ensure their fitness for human consumption and to identify any signs of abnormalities or injuries that may affect food safety. Here are the key steps involved in conducting an external assessment during ante-mortem inspection:

- **General observation**: Observe the animal's overall appearance, behavior, and demeanor. Look for any signs of illness, distress, or abnormal behavior that may indicate unfitness for slaughter, such as severe emaciation, weakness, or inability to stand.
- **Lameness or mobility issues**: Evaluate the animal's gait, coordination, and mobility. Look for signs of lameness, reluctance to move, stiffness, or abnormal posture. Limb abnormalities, such as fractures or severe joint swellings, may indicate a need for further examination.
- **External injuries or wounds**: Inspect the animal for any visible injuries, wounds, or lesions. Pay particular attention to open wounds, deep lacerations, or signs of recent trauma. Such injuries may render the animal unfit for slaughter or require specific interventions during the process.
- **Skin conditions:** Examine the animal's skin for signs of abnormalities, such as rashes, lesions, or infections. Look for any evidence of contagious skin diseases, such as ringworm or mange, which could affect food safety.
- **Swellings or abscesses:** Palpate the animal's body, paying attention to areas where abscesses or abnormal swellings may occur, such as the head, neck, shoulders, or limbs. Swellings or abscesses may indicate underlying infections or inflammatory conditions.
- **Respiratory signs**: Observe the animal's breathing patterns. Look for any signs of respiratory distress, such as rapid or labored breathing, coughing, or nasal discharge. These symptoms may indicate respiratory diseases that can affect meat quality or pose health risks.
- **Abdominal abnormalities:** Evaluate the animal's abdomen for any abnormal distension, asymmetry, or palpable masses. These could indicate conditions such as bloat, hernias, or tumors that may affect the safety and quality of the meat.

- **External parasites**: Check for the presence of external parasites, such as ticks, lice, or mites. While the presence of some parasites may not directly affect food safety, severe infestations could be a sign of poor animal health or welfare.

3.5. Identify and take appropriate action for abnormal characteristics prior to slaughter

Identifying and addressing abnormal characteristics, potentially hazardous conditions, or diseases prior to slaughter is crucial for ensuring food safety and animal welfare. Here are some steps that can be taken:

I. Pre-slaughter inspection: Trained inspectors should conduct thorough examinations of animals before they enter the slaughter process. This inspection may involve visual assessments, palpation, and other diagnostic procedures to identify any abnormalities or signs of diseases.

II. Animal health records: Maintaining comprehensive records of the health and medical history of animals is important. These records can help identify any pre-existing conditions or diseases that may pose a risk during slaughter. Regular veterinary check-ups and adherence to vaccination protocols can also contribute to early detection and prevention of diseases.

III. Quarantine and isolation: Animals that exhibit signs of illness, injury, or abnormal behavior should be isolated from the rest of the herd or flock. Quarantine protocols can help prevent the spread of infectious diseases and allow for further evaluation and appropriate treatment.

IV. Veterinary oversight: Having a veterinarian involved in the pre-slaughter process provides expertise in identifying and managing potential health issues. Veterinarians can conduct examinations, diagnostic tests, and provide treatment recommendations to ensure the health and welfare of the animals.

V. Hazard analysis and critical control points (HACCP): Implementing a HACCP system can help identify and control potential hazards throughout the entire slaughter process. This includes identifying potential risks related to animal health, such as diseases or contamination, and implementing appropriate preventive measures and monitoring procedures.

VI. Animal welfare considerations: In addition to health-related concerns, it is important to address any abnormal characteristics or conditions that may compromise animal welfare. These may include lameness, severe injuries, or signs of undue stress. Proper handling, stunning, and euthanasia protocols should be followed to minimize suffering.

VII. Collaboration with regulatory authorities: Slaughterhouses should maintain a close working relationship with relevant regulatory authorities, such as food safety agencies or veterinary services. These agencies can provide guidance, inspections, and oversight to ensure compliance with regulations and standards.

It is important to note that the specific actions to be taken may vary depending on local regulations, industry practices, and the nature of the abnormalities or diseases identified. Consulting with veterinary professionals and regulatory bodies is crucial to establish appropriate protocols for identifying and addressing these issues prior to slaughter.

3.5. Ante mortem examination

Performing ante mortem examination of animals refers to the examination conducted on live animals to assess their health, identify diseases, and ensure their suitability for various purposes such as food production, research, or transportation. It involves a thorough physical examination, observation of behavior, and collection of samples for laboratory analysis if necessary.

3.5.1. Reasons for ante mortem inspection

There are several reasons for conducting ante mortem inspection:

a. **Disease detection**: Ante mortem inspection helps identify animals with signs of infectious diseases, such as bovine tuberculosis, brucellosis, or foot-and-mouth disease. Detecting and removing these animals from the food chain helps prevent the spread of diseases to humans through meat consumption.

b. **Food safety**: Ante mortem inspection helps identify animals that may be unfit for human consumption due to factors such as poor nutrition, injuries, or

exposure to harmful substances. These animals can be excluded from the food supply to ensure the safety of the meat. Check for conditions of transport vehicles, Identify excessively soiled animals and take appropriate action.

c. **Animal welfare:** Ante mortem inspection allows for the identification of animals that may be suffering from injuries, diseases, or other conditions that would cause unnecessary pain or distress during the slaughter process. These animals can be treated or euthanized to prevent further suffering. Postpone slaughter of fevered/excited animals

d. **Compliance with regulations**: Ante mortem inspection is often a legal requirement in many countries to ensure compliance with food safety and animal welfare regulations. It helps maintain the overall quality and safety standards of the meat industry.

3.5.2. Guidelines and principles of AMI

The guidelines and principles of ante mortem inspection are typically set by regulatory bodies responsible for food safety and public health. The guidelines and principles for ante mortem inspection in Ethiopia are provided by the Ethiopian Ministry of Agriculture. These guidelines ensure the safety and quality of animal products for human consumption by applying the following principles.

- No animal shall be slaughtered without undergoing ante-mortem inspection
- All animals should be inspected within 24 hrs of delivery
- If 24 hrs have elapsed after ante-mortem inspection, the ante-mortem inspection should be repeated.
- Ante-mortem inspection should be made in well-lighted lairage pen and a crush for examination of individual animals.
- Every animal should be properly identified and accompanied by certificate,

which indicates the origin of the animal

- Animals should be inspected
  - ✓ At rest (static position): to asses posture, detect lameness, to study their behavior (excited or not)
  - ✓ In moving (motion) condition
    - AM should be started by Checking for movement permit before animals are offloaded and Do not have dirty hide, skin or fleece conditions which cause risk of contamination

3.6. Judgment for slaughter

Judgment categories at ante-mortem inspection refer to the different classifications or decisions made during the inspection of an animal before its death. These categories are used to determine the suitability of the animal for human consumption based on its health and welfare. The specific judgment categories may vary depending on the country or region, but some common examples include:

1) **Fit for slaughter**: This category is assigned to animals that are healthy and suitable for human consumption. No evidence of disease is noted.
2) **Condemned for slaughter**: This decision is made
   - If specific contagious diseases/zoonotic diseases have been detected
   - The animalhas been treated with antibiotics.
   - Emaciated animals, and those animals carrying toxic residues, Immature andweak
3) **Slaughter authorized under special precautions**: This judgment is passed
   - If the animal is suspected to have been infected with noticeable disease. Such animal is slaughtered in a separate section of the slaughterhouse or at the end of the slaughtering of healthy animals.

4) **Authorization for slaughter delayed**: This judgment is passed

- If the period of rest has not been maintained and animal affected by a condition, which temporarily limits the fitness of meat for human consumption.

5) **Emergency slaughter ordered**: This judgment is passed

- If the animal is affected by a condition, which does not affect the quality of meat and the public health. Such condition includes fracture of limbs, pelvis or ribs, extensive bruising, Dystocia, transport tetany, pregnancy toxemia in ewes, generalized mastitis, asphyxia and obstruction of the esophagus
- This judgment is passed for 2 reasons:
  - ✓ To relieve the animal from suffering and
  - ✓ To save economic loss from death of the animal
- Judgment on emergency slaughtered carcass:
  - ✓ The carcass needs to be totally condemned, if
    - The animal has died before slaughtering
    - The carcass is not accompanied with visceral organs and presented for inspection
    - The carcass reveals abnormal odor.

6) **Postponing the slaughter:** Reasons for postponing the slaughter can vary depending on the context. In general, some common reasons for postponing a slaughter might include:

- The slaughter of the animal may be postponed, if curable disease is diagnosed
- The animal is found in stage of late pregnancy
- The animal has been found treated with drugs, which may affect the consumer.

3.7. Carrying out slaughtering process

The slaughtering process refers to the process of killing animals for the purpose of obtaining meat. It is a complex process that involves several steps to ensure the humane and efficient slaughter of animals.

3.7.1. Pre slaughter care of slaughter animals

- Animals at lairages should be rested between 12-24 hrs (maximum 36hrs) slaughtered.
- Provided with adequate and suitable feed and water every 12 hrs during the journey except when the journey is completed within 15 hrs.
- Reduce fatigue, injuries, stress, infections.
- Should receive ample drinking water. This will serve to lower the bacterial load in the GIT and facilitate removal of the hide during dressing.
- Animals need to be fasted for at least 6hrs before slaughter to reduce stomach contents which serves as to prevent carcass contamination if the stomach is accidentally punctured. Moreover fastened animals bleed better, carcass is easier to dress and has a brighter appearance.
- The lairage should be 10m away from slaughter house. Pen areas required for each species are for cattle 1.7m2/head, for pigs/sheep 0.35m2/head and for goats' 0.25m2/head.

3.7. 2. Slaughtering and dressing operations

Slaughter process: killing of an animal by severing the major blood vessels in the neck region. This is the process of putting the animal to death. Here are some key aspects of the slaughtering process: It involves, stunning, bleeding, dressing/flaying,

evisceration, carcass splitting (cattle/large stock), trimming and washing, chilling and freezing.

A. Stunning: The first step is to render the animal unconscious or insensible to pain before slaughter. It is the process of making the animal unconscious. It is mostly practiced inmost of the modern slaughter houses. The purpose of stunning is to

- ✓ Reduce stress on the animal
- ✓ To prevent injury to the butcher
- ✓ To promote efficient bleeding
- ✓ To make unconscious the animal

Methods of stunning

i. **Sledge hammer:** it contains a long handle made up of iron. The weight of hammer is around 2 kg. It is used for striking an animal on the forehead and within few minutes the animal becomes unconscious.



Figure 3.1 Sledge hammer

ii. **Captive bolts:** Stunning by concussion of the brain through an impact of the bolt with the skull of animals. Gun powder (cartridge), compressed air and spring under tension drive bolts through the skull of animals. This type of stunning is widely used for

all farmed animals. It is called ‘captive’ since the bolt is shot out of the barrel but remains attached to the pistol. A captive bolt stunning gun kills the animal and reduces it instantly unconscious without causing pain. A captive bolt gun has a steel bolt that is powered by either compressed air or a blank cartridge. The bolt is driven into the animal's brain. It has the same effect on the animal as a firearm with a live bullet. After the animal is shot the bolt retracts and is reset for the next animal. A captive bolt gun is safer than a firearm. There have been some questions about whether or not a captive bolt actually kills an animal. Practical experience in slaughter plants indicates that cattle shot correctly with a penetrating captive bolt have irreversible damage to their brain and they will not revive.

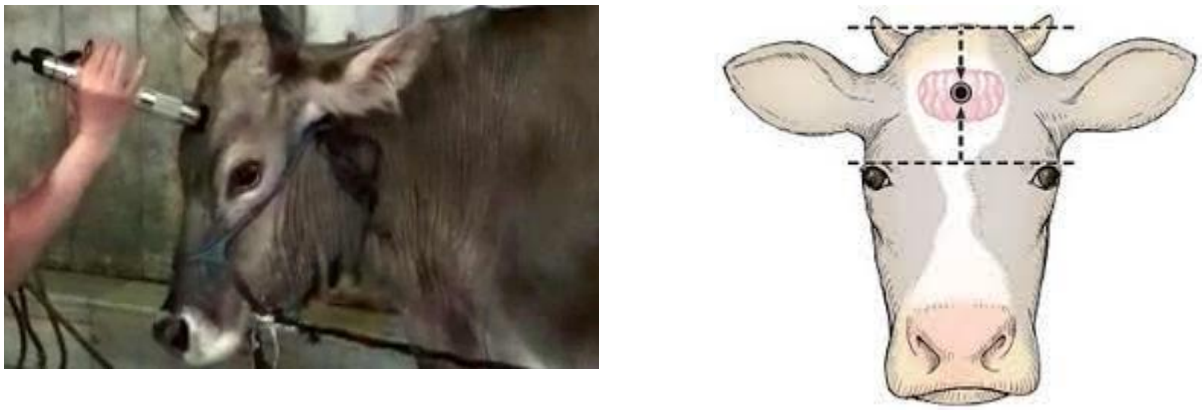


Figure 3.2: sites of Captive bolt

iii. **Electrical:** here we use the electrical current of magnitude of 75 volts for 10 seconds. The technique involves the application of a pair of electric tongs on either side of the animal’s head. An electric current is then passed through the brain and this supposedly leads to the temporary loss of consciousness.

iv. **Firearm (gunshot):** Used for animals difficult to handle such as wild pigs, bison, deer, horses or in emergencies.

v. **Carbon dioxide:** A CO2 gas chamber is designed on the principle that carbon dioxide is heavier than normal atmospheric air. Birds may be stunned using CO2 and Argon gas

while they remain in their crates. Pigs are also gassed using CO2. Pig becomes unconscious by 70% CO2 within 20-25 seconds.

B. Bleeding: Bleeding is affected by severing the neck at the level of the jugular and hanging the animal upside down on the rails. The main purpose of bleeding is to remove blood from the carcass otherwise it cause decomposition since blood is a good medial for bacterial growth and multiplication. Bleeding is hastened by hoisting and hanging the animal upside down on the rails for some time. It is expected that as much blood as possible (up to ½ of total amount) is removed from the stunned animal after the bleeding process. It is important that the heart continues beating after stunning to ensure complete bleeding.

The efficiency of bleeding has a bearing to the keeping quality of meat. Blood is a good medium for growth of microorganisms and hence its presence in the carcass will accelerate (hasten) spoilage/deterioration of meat. A carcass that is not well bled looks dark and muscles ooze (produces) blood when cut. Blood vessels (especially subcutaneous and intercostals vessels appear injected with blood while visceral organs (lungs, heart, liver and lymph nodes) contain excessive blood, are fluffy and watery. Carcasses that are not properly bled are condemned during meat inspection. The animal is hanging in a bleeding area, perhaps over a trough. At least 6-8 minutes must be allowed for bleeding cattle, 5-6 minutes for pigs and 3-4 minutes for sheep. If shorter periods are allowed, blood will drip on the dressing floor, causing contamination in this work area or a loss of blood meal where by-products are manufactured.

The bleeding trough floor must slope steeply in the direction of a floor drainage opening situated directly below the bleeding point. It is advisable to drain the blood separately,so there should be a second opening for washing water. The opening, which is not in use, must be closed with a plug. There are still problems attached to the disposal of blood other than

by processing in a sterilization plant. If blood is disposed of in the drainage system it overloads the purification works, while unpleasant odours emanate from septic tanks into which it is drained. Larger abattoirs in particular experience problems with the burying of blood.

i. Objectives and methods of bleeding

The objectives of bleeding during the slaughtering process are primarily to ensure the humane and efficient killing of animals, as well as to improve the quality and safety of the meat produced. Bleeding is an important step in the slaughter process as it helps remove blood from the animal's body, which can affect the taste, appearance, and preservation of the meat. Bleeding is typically achieved by severing the major blood vessels in the neck of the animal after stunning or stunning and slaughtering. This process allows the blood to drain out of the body, reducing the risk of bacterial contamination and improving the meat's color and texture.

It's important to note that the methods and practices of bleeding during slaughtering can vary depending on cultural, religious, and legal requirements in different regions. Therefore, it's essential to consult specific guidelines and regulations applicable to your area. Mostly bleeding can be done by two methods:

- **Vertical bleeding**: After hoisting on overhead rail, carotid arteries and jugular veins of both sides are severed across the throat region, caudal to the larynx.
- **Horizontal bleeding**: On the floor, skin is incised along jugular furrow and carotid artery and jugular vein of one side are severed. The knife is then passed to the chest severing the anterior aorta and anterior vena-cava.

Vertical bleeding have advantageous than horizontal bleeding

- ✓ Safe and comfortable

- ✓ Maximum bleeding
- ✓ Reduces tedious work
- ✓ Save space
- ✓ Blood do not remains in the carcass so decomposition is not faster
- ✓ Avoid contamination

Sometimes, knife reaches too far in the chest puncturing the pleura and blood may be aspirated into the thoracic cavity. This results blood adheres to the parietal pleura especially the posterior edges of the ribs. This contamination of lungs is called back bleeding or overstocking.

Table 1. The minimum time allowed for bleeding and the amount of blood per species is:

Cattle	6 minutes	13 – 15 litres blood
Calf	5 minutes	2 – 7 litres blood
Sheep	5 minutes	1,3 – 2 litres blood
Pig	6 minutes	2 – 4 litres blood

C. Dressing/Flaying: The animal is then dressed, which involves removing the internal organs, skin, and other non-edible parts. The carcass is usually split into halves or quarters for further processing. Flaying is the removal of the hides and skin. It should be done carefully to preserve the wholeness of the hides and skins. They should not be punctured during flaying. Intact hides and skin fetch high prices as they produce quality leather and leather products. Proper flaying is done using special knives or pneumatic flaying machines. These yield hides and skins with minimum puncturing. The major sources of microbial contamination of carcasses are faeces. Faeces and soil adhering to the animal is carried to the abattoir on the hair, hide and hooves and tail of the animal. Efforts should be made to wash and dry the animals before they enter the plant. In addition, tails need be bagged/covered until hide is removed which is then kept separate from carcasses.

D. Evisceration: is the removal of internal organs such as stomach, liver, spleen, intestines and lungs. Should be done carefully to avoid puncturing of the stomach and spillage of its contents which can contaminate the carcass. Stomach contents contain a lot of disease agents that cause food poisoning to consumers.

E. Carcass splitting: Carcasses are split carefully through the backbone into two equal portions. The splitting can be accomplished manually using a panga and or an axe or by use of an electrical power saw.

F. Trimming: This is meant to remove contaminated and unaesthetic parts of the carcass. The aim is to enhance the aesthetic value of the carcass

The general slaughtering process animal =Lairage and ante-mortem inspection= Stunning and bleeding= Scalding and dehairing/feather removal/Skinning = Singeing and polishing= Head removal and evisceration= splitting, dressing &final washing Carcass chilling= Meat storage and distribution

3.8. Separation of offal and carcass

Separating offal (internal organs) from the carcass is an important practice in food handling and processing to prevent cross-contamination. Here's some information on how to carry out this separation effectively:

I. Proper hygiene: Before beginning the separation process, it's crucial to ensure that you and your work area are clean. Wash your hands thoroughly and sanitize any equipment or surfaces you'll be using.
II. Dedicated workspace: Set up a designated area for offal removal, separate from where you handle the carcass. This helps maintain a clear distinction between the two and minimizes the risk of cross-contamination.

III. Dedicated tools: Use separate knives, cutting boards, and utensils for offal and carcass handling. This prevents the transfer of bacteria or other contaminants between the two.

IV. Sequential process: Follow a specific order when processing the carcass and removing offal. For example, you may start by removing the internal organs before moving on to further processing the carcass. This ensures that any potential contaminants from the offal are not transferred back to the carcass during the process.

V. Proper disposal: Once the offal has been separated, it should be immediately placed in a designated container or bag for disposal. Make sure the container is tightly sealed to prevent any leakage or cross-contamination.

VI. Cleaning and sanitizing: After the separation process is complete, thoroughly clean and sanitizes all equipment, surfaces, and tools that came into contact with the offal. This step is essential to eliminate any remaining bacteria or pathogens.

VII. Personal protective equipment (PPE): Wear appropriate PPE, such as gloves and aprons, during the separation process. This further reduces the risk of cross-contamination and helps maintain personal hygiene.

Self-Check – 3	

Name_____ ID_____signature_____ date_____

Directions: Answer all the questions below according to the instruction

Test I: write true for correct statement and false for incorrect one (1pt each)

1. Veterinary technicians are constantly exposed to health related risk
2. A proper inspection service consists of a veterinary examination of the live animal.
3. No animal shall be slaughtered without undergoing ante-mortem inspection
4. All animals should be inspected within 24 hrs of delivery
5. If 24 hrs have elapsed after ante-mortem inspection, the ante-mortem inspection should be repeated.

Part II. Matching (1pt each)

A	**B**
1. Approved for slaughter	A. fracture of limbs
2. Condemned for slaughter	B. Zoonotic disease
3. Slaughter under special precautions	C. period of rest has not been maintained
4. Slaughter delayed	D. infected with noticeable disease
5. Emergency slaughter	E No evidence of disease

Part III multiple choice (1pt each)

1. One is not Reasons for ante mortem inspection
   B. Identify and separate sick from normal animals
   C. To avoid unnecessary suffering of animals with acute pain
   D. To postpone slaughter of fevered/excited animals
   E. For emergency slaughter excessively soiled animal

2. Which one is **not** a pre slaughter activities of food animals?
   A. provide rest B. proper feeding C. provide water D. stressing

3. Which of the following is **false** about stunning?
   A. increase stress b. facilitate our work c. reduce injury d. promote bleeding

4. Which one is the **most preferable** method of stunning
   a) Carbon dioxide (Gas)
   b) Electricity
   c) Captive bolt
   d) D. Stabbing

Part II: Give best answer for the following questions(14Pts)

1. List basic equipment required AME
2. List reasons for emergency slaughter ordered: fracture of limbs,
3. List basic preliminary information about the animal should be relevant at ame
4. Define the following terms
   a) Slaughtering
   b) Stunning
   c) Dressing
   d) Evisceration

Note: Satisfactory rating – 28 points Unsatisfactory - below 28 points

Operation sheet 2

2.1. Procedures for Ante-mortem inspection

A. Tools and equipments: Required PPE (gown, boots, gloves, head cover, apron),

- Animals with well equipped abattoir , note book, weight balance, adequate light)

B. Procedure of Ante-mortem inspection

i. Wear clean PPE
ii. Inspect animals at the lairages while at rest and in motion for general behavior, level of nutrition, obvious signs of disease and any other abnormalities
iii. For animals found to be sick or in poor condition, record species, age, condition,color and identification marks, their place of origin and travel routes for easy offollow-up Then send them for emergency slaughter.
iv. Dead animals are removed and sent to the post-mortem room for autopsy examination to determine the cause of death except if anthrax is suspected. Afterthe autopsy the cadaver is incinerated or buried.
v. Animals found fit for human consumption are taken for slaughter
vi. AMI should be carried out under adequate natural or artificiallighting.

Lap test-1		

Name_____ ID_____ Signature_____-Date_____

Time started: 3:00 Time finished: 4:00 local time

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

Task-1: perform Ante-mortem examination

LG #18 LO4 Conduct post-mortem examination and follow up maintenance of cold chain

Instruction sheet 4

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

- Performing postmortem examination and Judgment for consumption
- Preservation methods of meat
- Cleaning, disinfection and bio-security of post mortem area
- Record keeping for ante mortem and postmortem 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:

- Physical examination of the carcass and offal are carried out for the detection of Pathological lesions following guidelines and principles of PME by veterinarians
- Judgment after PME is passed on carcass based on examination results and in accordance with standard guidelines and procedures
- Carcass and other offal are maintained in to the cooling and chilling are for preservation or directly transported for distribution
- Whole or part of carcass with suspicious signs are labeled and taken to separate room
- All information about the animal examined and the records of observations made during the post-mortem are collated and forwarded to the relevant persons for analysis and diagnosis
- Post mortem area and equipment used are hygienically cleaned, disinfected and stored for re-use

• Personal biosecurity clean-up is completed in accordance with the institution's policies and procedures hygienically cleaned, disinfected and stored for re-use
Learning Instructions:
1. Read the specific objectives of this Learning Guide. 2. Follow the instructions described below and try to understand what are being discussed. 3. Ask your teacher for assistance if you have hard time understanding them. 4. Read the information written in the information Sheets 5. Accomplish the Self-checks. 6. Perform Operation Sheets 7. Do the “LAP test”

Information Sheet 4

4.1. Performing postmortem examination and Judgment for consumption

Post-mortem inspections refers to examination of the carcass and associated organs after slaughtering to detect and eliminate abnormalities including contamination to ensure only meat fit for human consumption is passed for food. The reasons for post-mortem inspection are to:

- Check the efficiency of slaughter and carcass dressing techniques
- Identify diseased carcasses and organs and remove them from the food chain
- Detect visible contamination to avoid harmful and unaesthetic products from reaching the consumer
- Ensure hygienic processing of meat

4.1. 1. Guidelines and principles of post-mortem inspection

A. Guidelines of post-mortem inspection: The guidelines for post-mortem inspection of meat in Ethiopia are primarily governed by the Ethiopian Meat and Dairy Industry Development Institute (EMDIDI) and the Ethiopian Food, Medicine, and Healthcare Administration and Control Authority (EFMHACA). These organizations establish and enforce regulations to ensure the safety and quality of meat products.

- Evisceration is effected without delay
- Incision are made without obliteration
- Offal, carcass, and heart are labeled and bear the same number
- No lesion is removed before judgment is passed
- No lesions are modified or obliterated to disguise meat inspection
- No removal of organs or carcass before final judgment is passed

- No removal of identification marks

B. Principles of post-mortem inspection: The principles of post-mortem inspection of meat in Ethiopia are based on the Food, Medicine, and Healthcare Administration and Control Authority of Ethiopia (FMHACA) guidelines. These guidelines ensure that meat and meat products are safe for consumption and meet the required standards. Some of the key principles of post-mortem inspection in Ethiopia include:

- **Visual Inspection**: A thorough visual examination of the carcass, organs, and lymph nodes is conducted to identify any abnormalities, diseases, or lesions that may render the meat unfit for human consumption.
- **Palpation:** The inspector may use their hands to feel and assess the texture, consistency, and condition of the meat and organs to detect any abnormalities or lesions.
- **Incision and Observation:** In some cases, an incision may be made to examine the internal organs for any signs of disease or abnormalities.
- **Hygiene and Sanitation**: The inspection process must be carried out in a clean and hygienic environment to prevent contamination of the meat.
- **Record-Keeping:** Detailed records are maintained during the inspection process, documenting any findings, actions taken, and decisions made.

A systematic approach should be used to ensure that nothing is missed. In general for red meat animals the systematic approach includes examination of the:

- Structures of the head;
- Organs (viscera) in the thoracic (chest) cavity;
- Viscera in the abdomen;
- Carcass

Special attention will be paid to examining the lymph nodes in all parts of the body: The lymphatic system is a one way closed circulatory system that allows tissue fluids to be returned to the blood stream. Any time there is an infection in an area, or region, of the

body, the lymph nodes of that area, or region, will show evidence of the infection. The degree of spread of an infection through the lymphatic system is a major factor in determining what should, or shouldn't be condemned

1. Head inspection procedure

In general this preparation includes:

- **Incise (cut) the outer and inner masseter (cheek) muscles**. This is done primarily to check for Cysticercus bovis. C. bovis is the intermediate form of the beef tapeworm which affects humans. Incision, of these muscles, will also occasionally detect other conditions. The incisions should be parallel to the mandible (jawbone) and they should go right through the muscles.
- **Observe and incise the following lymph nodes** for any evidence of edema, enlargement, abscesses, grittiness, or tumors.
    a) Left and Right parotid;
    b) sub maxillary (mandibular);
    c) Left and Right retropharyngeal
- **Visually examine, palpate and incise (if necessary) the tongu**e: This is done to check for abscesses, Actinobacillosis (wooden tongue) and other abnormalities. Localized conditions such as scars, sores and erosions are trimmed.
- **Tongue**: View and palpate (view only in calves up to 6 weeks of age). Cattle - except in calves up to six week of age, the esophagus of all cattle and calves should be separated from its attachment to the trachea and viewed. As part of inspection of all cattle and calves over the age of 6 weeks for Cysticercus bovis, the muscles of mastication should be viewed and one or more linear incisions made parallel to the lower jaw into the external and internal muscles of mastication.

2. Red entrails inspection procedure (heart, lungs, liver, kidneys, spleen)

- **Liver:** Give visual inspection and thoroughly palpate entire surface (both sides)
  - ✓ View the gall bladder
  - ✓ The hepatic (Portal) lymph nodes should be examined and incised 2-3 times.
  - ✓ The bile ducts should be opened longitudinally to observe for liver flukes.
  - ✓ Lymph nodes Portal (hepatic) view and incise.
  - ✓ Examine for fatty liver, faciolosis, actinobacillosis, *Cysticercus bovis* and certain parasitic conditions.
- **Heart** There are two options for incising the heart. *The first* is to make one or more incisions **from base to apex** that passes through the wall between the left and right ventricles. This allows observation of all of the heart valves. *The second option* is to evert the heart and make 3 to 5 shallow cuts in the musculature. These incisions should extend all the way through to the outer surface of the heart. If there is any suspicion that the animal may be affected with *Cysticercus bovis*, more incisions can be made.
- **Lungs:** Visually examine the exposed surfaces of the lungs then palpate them and incise (cut) them if indicated. The lungs are palpated to detect any deep lesions such as abscesses, tumors, chronic pneumonia, etc.
  - ✓ Examine the left and right bronchial, cranial and caudal mediastinal lymph *nodes*.
  - ✓ Inspector makes a cross-section incision to the trachea thus exposing the main bronchi then transverse vertical incision across the diaphragmatic lobes, main bronchus each trying to inspect the secondary and tertiary bronchi.
- **Spleen:** Inspect visually and palpation**.** The surface and substance should be examined for anthrax, hematoma,infarction and tuberculosis.
- **Gastro-intestinal tract:** For a proper examination the intestines should be spread out.
  1) Visually examine the four compartments of the stomach (reticulum, rumen, omasum and abomasum). There may be evidence of localized peritonitis, or abscess formation, if the reticulum has been penetrated by a nail, or piece of

wire

2) View and incise mesenteric lymph nodes. Usually incision to the mesenteric lymph nodes necessary if enlarged or if there is any possibility that the animal has tuberculosis.
3) View and incise if any lesions are observed in the sub maxillary lymph nodes.
4) The omentum, mesentery and any other fatty tissue that is going to be used for human consumption must be free of contamination
5) The serous surfaces of the organs are examined for tuberculosis and Actinobacillosis. Reticulum should be assessed for foreign body.

- **Kidneys:** examined for nephritis, calculi and nodules. The renal lymph node is examined for *tuberculosis.*
- **Inspection of the mammary gland:** Lactating or sick mammary glands will not be used for human consumption. Non- lactating udders can be preserved for food purposes, provided that adequate facilities are provided to manipulate and inspect them. The inspection of the udder will consist of examination through touch or through 5 cm. incisions. Udders from cow that are positive to brucellosis and tuberculosis should be condemned.
- **Uterus:** uterus should be examined for evidence of pregnancy or recent parturition. In Brucella reactors, the uterus should not be handled or incised since the disease is highly infectious to human.

3) Carcass inspection

Carcass inspection refers to the process of examining animal carcasses to ensure their safety and suitability for consumption. It is an essential step in the meat industry to ensure that meat products meet the necessary quality and hygiene standards. The carcass should be examined to ascertain:

✓ Efficiency of bleeding;
✓ Colour;

- ✓ Condition of serous membranes (pleura and peritoneum);
- ✓ Abnormalities;
- ✓ Cleanliness;
- ✓ Odours.

- **The skeletal muscles**, including the. attached fat and connective tissues, the bones, especially those which have been cut and exposed during the splitting of the carcass, the joints, the tendon sheaths, the diaphragm and the pleura and the peritoneum, should be viewed and, if necessary, palpated and incised. If necessary the **triceps brachial muscle** may be incised.
- **The following lymph nodes** should be viewed, palpated and, if necessary, incised:
  - ✓ Superficial inguinal (supra-mammary) (lymphonodi inguinal superficial);
  - ✓ External and internal iliac (lymphonodi iliaci);
  - ✓ Pre-pectoral (lymphonodi cervical profundi caudales);
  - ✓ Renal (lymphonodi renales).
- **Any abnormalities of muscles, bones, tendons, joints** or other tissues; and the main carcass lymph nodes –precrural, popliteal, anal, superficial inguinal, ischiatic, internal and external iliac, lumbar, renal, sternal, prepectoral, prescapular and atlantal nodes, as well as the lymph nodes of the head and viscera should be incised and examined in all animals in which systemic or generalized disease is suspected, positive to a diagnostic test for tuberculosis and in which lesions suggestive of tuberculosis are found at post-mortem inspection. In all animals the following examination techniques should be used for specific lymph nodes:
  - Superficial inguinal (male) – palpate;
  - Supramammary (female) – palpate and incise when udder is or has been in lactation, or in the case of mastitis;
  - Eexternal and internal iliac – palpate
  - Prepectoral – palpate;
  - Popliteal – palpate (only sheep/goats);
  - Renal – palpate (cattle) or incise if disease is suspected;

- Prescapular and prefemoral – palpate (only sheep and goats).

4.2.2. Decisions at post-mortem inspection:

Post-mortem inspection is part of the wider process of screening animals and meat for fitness for human consumption. It includes on-farm monitoring, ante-mortem inspection, and HACCP implementation in abattoirs.

1) **Approved for human consumption:** This judgment is passed
   - When no disease or abnormal condition or residues are detected
   - If the slaughter operation has been performed in hygienic manner
2) **Totally condemned:** if one or more of the following conditions are met
   - If the food animal is infected with infectious, contagious disease or zoonotic disease.
   - If residues beyond the normal limit is detected
   - If there is severe organoleptic deviation from normal meat
   - The meat has been conditionally approved for human consumption, but this hasnot been treated by heat or cold.
3) **Partially condemned for human consumption:** This judgment is passed, if abnormalities or defects are encountered in certain parts of the organ or carcass. .
4) **Conditionally approved for human consumption:** This judgment is passed, **i**f the carcass or organ poses hazards to the public or animal health. But the hazard can be eliminated through proper treatment
5) **Inferior meat: i**f the meat is below accepted standard, but does not pose public hazard when consumed.
6) **Approved** for human consumption with distribution restricted to limed areas:
   The judgment is passed, if
   - The animal originated from an area where there is an outbreak of disease and slaughtering has been recommended to contain the disease in that area or
   - The animal comes from quarantine stations.
7) **Detained:** carcass may be detained for further inspection under
   - Slight discoloration e.g. as in the case of jaundice

- If chemical, toxicological or microbiological examination is require

4.2.3. Carry out physical examination of the carcass and offal for the detection of pathological lesions at PME

Performing a physical examination of a carcass and offal (internal organs) during a postmortem examination can help in detecting any pathological lesions or abnormalities. Here is a general outline of the steps involved in conducting such an examination:

- **External Examination:** Begin by visually inspecting the overall appearance of the carcass.
  - ✓ Look for any visible abnormalities, such as external injuries, swellings, or skin lesions.
  - ✓ Note the body condition, weight, and age of the animal.
  - ✓ Observe the color and texture of the skin, hair, and feathers, if applicable.
- **Opening the Carcass:**
  - ✓ Make a midline incision along the abdomen to gain access to the internal organs.
  - ✓ Observe and record any abnormal odors or fluids that may be present.
- **Examination of Body Cavities:**
  - ✓ Explore the thoracic (chest) and abdominal cavities.
  - ✓ Inspect the pleural cavities for any signs of inflammation, fluid accumulation, or tumors.
  - ✓ Observe the position and appearance of the diaphragm.
  - ✓ Assess the abdominal organs, including the liver, spleen, kidneys, gastrointestinal tract, and reproductive organs.
  - ✓ Look for abnormalities such as discoloration, enlargement, nodules, abscesses, tumors, or other noticeable lesions.
  - ✓ Pay attention to the presence of any abnormal fluid accumulation, such as ascites or peritonitis.
- **Examination of Specific Organs:**
  - ✓ Systematically examine each organ individually, noting any abnormalities.

- ✓ Cut representative sections of organs, such as the liver, kidneys, lungs, heart, and lymph nodes, for detailed examination.
- ✓ Look for changes in color, texture, size, and consistency.

- **Identify and document any masses, abscesses, cysts, hemorrhages, necrotic areas, or other lesions.**
  - ✓ Sampling for Laboratory Analysis:
  - ✓ Collect samples of any suspicious lesions or organs for further laboratory testing (e.g., histopathology, microbiology, toxicology).
  - ✓ Properly label and preserve the samples according to the recommended guidelines.

4.2.4. Decisions for common pathological lesions/abnormality

- **Fever (Pyrexia):** Fever is an abnormal elevated body temperature. It may be classified as septic and aseptic according to the presence or non presence of an infection. In *septic fever* the infection is caused by viruses, bacteria, bacterial toxins, protozoa and fungi.
  Judgment: Carcass is *condemned* if fever syndrome is associated with presence of bacteria or bacterial toxins in the blood and/or findings of drugs and antimicrobial substances.
- **Septicemia**
  Judgment: The animals, animal carcasses, offal and other detached portions of animals affected with septicemia are condemned.
- **Pigmentation**

✓ Melanosis**:** is an accumulation of melanin in various organs including the kidneys, heart, lungs and liver and other locations such as brain membranes, spinal cord, connective tissue, periosteum etc. Melanin is an endogenous brown-black pigment randomly distributed in tissue.

Judgment:

- Carcasses showing extensive melanosis are *condemned.*
- If the condition is localized, only the *affected organ* or part of the carcass needs to be condemned.

- ✓ **Icterus (Jaundice):** is the result of an abnormal accumulation of bile pigment, bilirubin, or hemoglobin in the blood. Yellow pigmentation is observed in the skin, internal organs, sclera (the white of the eye), tendons, cartilage, arteries, joint surfaces

  Judgment:

  - The carcass and viscera with hemolytic, toxic icterus and obstructive icterus are *condemned.*
  - Less severe cases are kept in the chiller for 24 hours. Upon re-examination, the carcass may be *approved or condemned* depending on the absence or presence of pigment in the tissue.
  - If the obstructive icterus disappears after 24 hours, the carcass and viscera can be *passed* for human food.

- **Hemorrhage and Hematoma:** Hemorrhage is seen at slaughter in various organs, mucous and serous membranes, skin, subcutaneous tissue and muscles. It may be caused by trauma, acute infectious diseases or septicemia.

  Judgment:

  - ✓ A carcass is *approved* if the hemorrhage is minor in extent and is due to physical causes. The affected tissue is *condemned*.
  - ✓ A carcass affected with extensive hemorrhage where salvaging is impractical, or a hemorrhagic carcass associated with septicemia is *condemned*.

- **Bruises:** Bruises are frequently found on antemortem and post-mortem examination in food producing animals and poultry. In cattle bruises caused by transportation or handling are commonly found in the hip, chest and shoulder areas; in pigs within the ham and in sheep in the hind leg. Bruises and hemorrhage in the hip joint are caused by rough handling of animals during shackling. Bruises in poultry can be localized or generalized and are frequently associated with bone fractures or ruptured ligament tendons.

  Judgment:

  - ✓ Carcasses affected with local bruising are *approved* after being trimmed.
  - ✓ Carcasses affected with bruises or injuries associated with inflammatory lesions are also *approved* if tissue reaction *does not extend beyond the regional lymph nodes*. The affected area should be *condemned*.

- ✓ When bruises or injuries are associated with systemic change and the wholesomeness of the musculature is lost, the carcass will be *condemned*.

- **Abscess:** An abscess is a localized collection of pus separated from the surrounding tissue by a fibrous capsule.

  - ✓ Liver abscesses caused by Fusobacterium necrophorum.

  Judgment

  - ✓ The animals affected with abscesses spread through the blood stream (pyemia) are *condemned* on antemortem if the findings of abscesses are over most areas of the body and systemic involvement is evident as shown in elevated temperature and cachexia.
  - ✓ On postmortem examination, the carcasses are *condemned* for abscesses, if the abscesses resulted from entry of pyogenic organisms into the blood stream and into the abdominal organs, spine or musculature. Multiple abscesses in the liver require condemnation of the organ.

- **Emaciation**: Emaciation is a common condition of food animals and is characterized by a loss of fat and flesh following the loss of appetite, starvation and cachexia.

Judgment:

- ✓ On postmortem examination it is important to assess and differentiate emaciation from leanness. In case of doubt, the carcass may be held in the refrigerated room and the general setting of the carcass should be examined the following day.
- ✓ If the body cavities are relatively dry, edema of muscle tissue is not present and fat is of an acceptable consistency i.e. has “set”, the carcass may be *passed* for food.

- Edema: Edema is the accumulation of excess fluid in the intercellular (interstitial) tissue compartments, including body cavities.

  Judgment:

  - ✓ Animals affected with generalized edema may be *condemned* on antemortem inspection. In less severe non-generalized cases, animals are treated as “*suspects*”.

- ✓ The carcass may be *totally or partially condemned* depending on the extent and cause of the condition. The presence of localized edema necessitates *removal* of the affected area. The carcass is then *approved.*

- **Emphysema:** Emphysema in animals is associated with some disease conditions and is caused by an obstruction to the outflow of a air or by extensive gasping respiration during slaughter procedures.

  Judgment:

  - ✓ Affected lungs are *condemned.*

- **Calcification:** is the deposition of calcium salts in dead and degenerating tissue. It may be regarded as a body reaction to immobilize some foreign agents.

  Judgment:

  - ✓ Carcass and viscera affected with presternal calcification are *approved*.
  - ✓ Affected brisket is *condemned*.
  - ✓ Calcified parasitic organs and heart in dairy cows are also *condemned*.

- Abnormal odors: Abnormal odors may result from the ingestion of certain feedstuff, drugs, various pathological conditions, absorption of odors from strong smelling substances and sexual odor from some male animals.

Judgment:

- ✓ The carcass having fish meal odor has *inferior* meat. Viscera and organs are also inferior.
- ✓ Generalized drug treatment requires *condemnation* of the carcass.
- ✓ If local treatment and withholding periods are observed, the carcass and viscera are *approved*.
- ✓ Sexual odor in a carcass can have a *limited* distribution according to the consumers taste. Extremely strong sexual odor requires *condemnation* of the carcass.
- ✓ A carcass which gives off a pronounced odor of medicinal, chemical or other foreign substances shall be *condemned*. If the odor can be removed by trimming or chilling, the carcass *may be passed* for human food after the removal of affected parts or dissipation of the condition.

- Immaturity: The slaughter of calves younger than two weeks of age is prohibited. Judgment:

  ✓ Carcass and offal of immature animals are *condemned*.

4.2.5. Maintaining Carcass and offal in to the cooling and chilling are for preservation

Food preservation is a process of treating and handling food to stop or slow down spoilage and thus allow for longer period of storage. Preservation plays a vital role in ensuring safety, controlling spoilage and extending the shelf-life of meat facilitates the distribution of meat to distant places. The methods of meat preservation include drying, chilling, curing, fermentation, irradiation, chemical treatment and thermal processing (canning).

Food preservation aims at

- Extension of the safe storage life of food, (Preventing growth of bacteria, yeast and molds and other microorganisms)
- Preventing oxidation of fats which cause rancidity
- Arresting enzymatic deterioration of food
- Preserving the nutritional value, texture Acceptability, Safety, and flavor of food.
- Protecting food against attack by pests during storage.

4.2.6. Preservation principles and methods

Two general principles are employed in food preservation.

- Inhibition principle
- Killing principle,

1. Inhibition principle. In this principle, food preservation is achieved by inhibition of growth and multiplication of microorganisms. The inhibition principle can be achieved by any of the following methods:

- Reduction in available water e.g. by drying and salting
- Reduction in pH e.g by fermentation and addition of acids.
- Use of preservatives, e.g sodium benzoate

- Use of low temperatures (chilling or freezing)
- Smoking – which has a drying and preservative effect

Preservation by these methods does not necessarily imply the destruction of microorganisms. This is because, on removal of the inhibiting influence, the food will undergo spoilage.

A. Food preservation by lowering pH. Many food products can be preserved by lowering pH so that the growth of spoilage and pathogenic bacteria is prevented. The lowering of pH can be achieved by addition of acids and fermentation. The inhibitory effect of acids is exerted whether the acid is added directly to food, is a constituent of the food, or is produced in the food by fermentation.

B. Food preservation by lowering of available water. Preservation of food by lowering water activity has been practiced for centuries. On harvesting, most foods contain enough moisture to permit action by their own enzymes and by microorganisms. In order to preserve such foods, it is necessary to remove the free water (moisture) necessary for enzyme and microbial activity. Lowering of water activity can be achieved by:

- Addition of salt
- Drying

C. Food preservation by salting. Salting is commonly employed in the meat industry in the curing of meat and production of cured meat products. Sodium chloride and small amounts of nitrates and nitrites is commonly used for this purpose.

The salting procedure can be performed in four ways:

- Dry cure in which the meat or fish is rubbed with salt and stacked between salt layers.
- The products are immersed in pickle of brine, usually containing about 15% salt. The brine can be used over again if carefully handled.
- The injection cure, in which a concentrated solution of the ingredients is injected by needle into the muscular tissue in various parts of the meat by using a pickle injector machine. The advantage here is that the salt enter into the inner of the product more rapidly, thus greatly shortening the curing time
- Direct addition method in which the salt or curing agents are added directly to finely ground meats such as sausage. The preservative effect of salt is often supported by

drying, chilling, chemical preservatives and/or heating.

D. Food preservation by drying. Drying is the most widely used method of food preservation. Some foods e.g grains are sufficiently dry as harvested, or with little dryingcan remain unspoiled for long periods under proper storage conditions. Dry foods store for a long time at room temperature under low humidity. Properly dried foods stored in moisture proof containers can stay for over one year. Moisture may be removed from foods by means of the sun's rays or the modern artificial methods. Microorganisms and parasites present in the product before drying will survive the drying process.

1. Sun drying. Food is spread in the sun to dry. Sun drying is commonly used to dry grains, certain fruits such as raisins, prunes, figs apricots; meat and fish. Sun drying requires large land area and has problems of contamination from dust, insects, birdsand rodents. To sun dry fish, the fish scales and offal have to be removed before the fish are spread out in the sun to dry on raised rack or clean sacks or mats. On the other hand meat is cut into thin long strips or slices and then hangs outdoors to dry.

2. Mechanical driers. Mechanical driers are used to produce dehydrated or desiccated food product. A dehydrated or desiccated food has been dried by artificially produced heat under controlled conditions of temperature, relative humidity and air flow.

E. Food preservation by use of low temperatures. Two methods are employed to arrest microbial growth and multiplication. These are chilling (cold storage) and freezing.

1. **Chilling** is keeping food at temperatures between 0-15oC. The common chilling temperatures ranges between 4-5oC. Temperatures that are just above freezing point maintain foods near their original condition for a limited time (2-4 days). Chilling alone is not considered as a method of food preservation, but a method to prolong the shelf-lifeof fresh products.

2. Freezing is keeping food at temperatures between 0oC and -35oC. However, because of the content of electrolyte, most foods will start to freeze at -2oC to -5oC. Low temperatures are used to retard chemical reactions and actions of food enzymes and to slow down or stop the growth and activity of microorganisms in the food. A low enough temperature will prevent the growth of any microorganisms.

F. Food preservation by smoking. Smoking is commonly employed in the meat industry to preserve and give flavor to meat. Smoking has three main purposes,

1. Aids in preservation
2. Adds the desired flavour, and
3. Improve color of the food. Smoking preserves by:

- Impregnation of preservative chemicals from the smoke on the surface of food,
- Drying effect of smoke reduces the water activity of the food,
- Heat of smoking may also destroy microorganisms.

The smoke can be produced in certain smoke generators and the smoke conducted into the smoking room or cabinets. Wood smoke contains a large number of volatile compounds that differ in their micro biocidal or micro biostatic activities

Use of preservatives: Preservatives are physical or chemical substances used to prolong the shelf-life of a food by protecting against deterioration caused by microorganisms. Chemical preservatives for use in food preservation must be

- Non- toxic and non-carcinogenic to mammals,
- Should not react with other substances to produce toxic substances and
- Should not restore a bright colour or freshness of already spoiled food product.

A good preservative should have a good inhibitory power against a wide range of microorganisms. The use of preservatives should embrace the principle of good manufacturing practices, where only a minimum level to achieve the desired keeping quality is used. Preservatives can be grouped into:

2 Killing principles: In this principle, spoilage microorganisms are destroyed in the food and thereafter the food is protected against subsequent contamination by beingenclosed in an

air tight container. This principle is achieved by heating: Two methods are used to preserve food by heat treatment. These are: (i). Pasteurization, and (ii) sterilization.

A. Pasteurization. Is a process of heat treatment of a food substance at specific temperatures and times, aimed at destroying all pathogenic microorganisms except spores, without affecting the nutritive quality of the food. Pasteurization leads to destruction of 99% of all vegetative organisms and all pathogenic microorganisms. Pasteurization is commonly employed in the milk industry. Three methods are usually employed:

- Low temperature, long time (63^{o}C for 30 minutes)
- High temperature, short time (72^{o}C for 15 seconds)
- Flash method at 80^{o}C for 1-2 seconds/or continuously

B. Sterilization Is a physical or chemical process which destroys or eliminates all forms of life especially microorganisms from a given substance such as food. Sterilization can be achieved by heating food at temperatures above 140oC. Some of the foods preserved by sterilization include ultra heat treated milk and canned meat. During sterilization, some food nutrients are destroyed such as vitamin C. However, sterile foods store for a long time. Such foods only spoil through occurrence of chemical reactions in the stored food leading to fat rancidity and off-flavors.

C. Canning Preservation by application of high temperature Canning is the process of heating the product at a specified temperature for a specific length of time (pasteurizing), and then vacuum sealing the pasteurized food in special glass jars designed for this purpose. It can be used with most foods, including fruits, vegetables, meats, seafood, and some prepared foods. Canning requires the purchase of reusable canning jars and rings, one-time use sealing lids, and some practice to learnthe necessary and detailed steps. Purpose of Canning: means rendering meat sterile by packing it in hermetically

- To produce meat with long shelf life by
- Creating unfavorable condition for microbial growth.
- Destruction of microorganisms

4.2.6. Labeling and taking whole / part of carcass with suspicious signs to separate room

If you encounter a carcass with suspicious signs, it's important to follow proper protocols to ensure safety and prevent the spread of any potential diseases. Here's a general guideline on how to handle such a situation:

- Safety first: Put on appropriate personal protective equipment (PPE) before handling the carcass. This typically includes gloves, a lab coat or apron, and possibly a face mask or respirator, depending on the situation.
- Labeling: Attach a clear and visible label to the carcass indicating that it has suspicious signs. Include relevant information such as the date, location, and any observations you've made regarding the carcass.
- Isolation: Move the carcass to a separate room or area designated for handling potentially contaminated or suspicious material. This helps minimize the risk of cross-contamination and ensures that the area can be properly cleaned and disinfected afterward.
- Documentation: Take detailed notes about the carcass, including its condition, any visible abnormalities, and any other relevant information. This documentation will be useful for further investigation or analysis.
- Reporting: Notify the appropriate authorities or personnel responsible for handling such situations. This could include local veterinary services, public health agencies, or the relevant department within your organization. They can provide guidance and assistance in determining the next steps.
- Expert consultation: If possible, consult with experts or specialists in veterinary medicine, pathology, or public health to assess the situation and provide further guidance on handling and testing protocols**.**

4.3. Cleaning, disinfection and bio-security of post mortem area

Cleaning and disinfection – also known as C&D – is a key part of any biosecurity plan. C&D reduces then kills disease causing germs, which helps to stop or reduce the spread of disease on your operation or to other locations. Where c&d should be used? Cleaning and disinfection

should be done for animal areas and items that contact animals. This includes pens, stalls or cages, footwear, and any equipment used in the care, handling or transport of animals or carcasses. • Animal Areas: C&D should be used for any buildings, pens, and enclosures where animals are housed. With dirt floors, take care to clean the area well by removing all manure from the area. • Equipment: Clean and disinfect any equipment used with animals, especially animals that are ill. This also includes tools used for the C&D process. • Vehicles: Vehicles used for animal transport (e.g., trailers) can transfer diseases to other animals and locations. C&D vehicles between uses and before leaving your operation. Vehicles should also be cleaned, especially tires and wheel wells, upon return to your operation. It is also important to C&D any heavy machinery, such as tractors or skid steers, used in animal areas. These on-site vehicles can easily become contaminated and when moved can spread diseases to other locations on or off your farm/ranch.



Figure 4.1 Cleaning, disinfection and bio-security of post mortem area

Footwear: C&D footwear after leaving animal areas, especially where sick animals are kept (e.g., isolation areas). Have boot cleaning areas near exit points to make this easier to do. Wash and scrub boots to remove visible manure or mud before applying the disinfectant. Boot baths are often used when entering and exiting an area. However, boot baths should not be used as the only method of disinfection. To disinfect correctly, boot baths must be properly maintained and

used, which can be difficult to do. As a result, the use of boot baths may give a false sense of security. However, the action of stepping into the disinfectant solution does make people more aware of biosecurity. If boot baths are used, the disinfectant solution should be prepared at least daily. If traffic levels or dirt and debris levels are high, the solution should be prepared more frequently to make sure it is more effective. As with disinfection of surfaces, make sure boot surfaces are covered for the full contact time required (per the label instructions).

You can use bleach diluted to 1% active sodium hypochlorite (the active ingredient in bleach). For example, dilute a bleach solution which is 4% active sodium hypochlorite using three parts water to one part bleach. Any other farm detergents and disinfectants can also be used as per label instructions. To prevent corrosion in your biosafety cabinet, use a squeeze bottle of 10% bleach (rather than spray) and follow it with a 70% ethanol rinse. Note on Ethanol – 70% ethanol also kills many organisms, but depending on the organism you are trying to kill, it has a contact time of up to 20 minutes.

4.4. Record keeping for ante mortem and post-mortem results

Records should be kept, as necessary and where practicable, to enhance the ability to verify the effectiveness of the food safety system. 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 basis used and be very simple. Good record keeping is vital in regards to meeting the organizational committeemen's and providing accurate information on which decision is made for the future. Another legal requirement is that food firms maintain records relating to the manufacturer, processing, packing, distribution, receipt or importation of food products. The purpose is to assist in determining whether anything has happened to the food or been done to the food that would render it unsafe (adulterated). 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 health
- Use of veterinary drugs and pest control chemicals
- Nature and sources of feed
- Milk storage temperature
- Equipment cleaning
- Results of testing where testing is performed
- Health status of personnel
- Traceability/product tracing recall

To keep record 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 on ante-mortem inspection card which are all described below:

a. Ante mortem inspection record sheet

Owner's name_____Address-_____Phone no_____-
Origin of animal----------The number of animals in the lot---------- Animal arrival time_____
Species_____- Sex of the animal_____
time of inspection---------- Date of ante-mortem inspection----------
Clinical signs observed_____ _____-_____- -Body temperature if relevant_____
Reason why animal is held_____
Decision/judgement_____-_____
Name of Inspector---------- **Signature of inspector**---------- **Date**----------

b. Post mortem inspection record sheet

Abattoir name_____Address_____- Phone no_____
Origin of animal----------The number of animals in the lot---------- Animal arrival time_____
Species_____- Sex of the animal_____
The time of inspection n---------- Date of post-mortem inspection----------
Signs observed for each organ and carcass---------- Head region ----------Judgement_____
Heart----------Judgement----------Lun----------Judgement_____ Liver and Kidn- -Judgement_____
Carcass----------Judgement_____
GIT organs inspection result_____Judgement___-_____-
Name of Inspector_____-_____ Signature_____Date_____-_____

4.4.1. Collate and forward post-mortem information and records for analysis and diagnosis

When forwarding information about the animal examination and post-mortem observations for analysis and diagnosis, it's important to provide comprehensive and accurate records. Here's a suggested approach:

- Compile the information: Gather all relevant information and records related to the animal examination and post-mortem. This includes any initial observations, clinical history, examination findings, and post-mortem findings.
- Organize the records: Arrange the information in a clear and structured manner to facilitate easy understanding and analysis. You can categorize the records based on different aspects such as clinical signs, gross findings, histopathology results, laboratory test results, and any other relevant data.

- Include animal identification: Ensure that the records include accurate identification details of the animal, such as species, breed, age, sex, identification numbers, and any other pertinent information that aids in identification.
- Provide a summary: Write a concise summary of the case, highlighting the key findings and observations. This summary should provide a brief overview of the animal's condition, the reason for examination, and the main findings from the post-mortem examination.
- Include photographs or diagrams: If applicable and available, include high-quality photographs or diagrams that illustrate significant findings. Visual aids can be valuable in assisting with analysis and diagnosis.
- Use standardized terminology: Utilize standardized terminology and nomenclature to describe the observations and findings. This ensures clear and consistent communication and facilitates accurate interpretation by the relevant persons.

Transmit the information: Share the compiled information and records with the relevant individuals or entities responsible for analysis and diagnosis. This may include veterinary pathologists, laboratory personnel, or other specialists involved in the investigation. Use secure and appropriate communication channels to maintain data confidentiality if necessary

Self-Check – 4	

Name_____ ID_____signature_____ date_____

Directions: Answer all the questions below according to the instruction

Part I: Write True if the statement is correct and False if incorrect (1pt each)

1. Post mortem inspection is the inspection of live animals prior to being slaughtered.
2. Any methods of slaughter aim at securing maximum bleeding& avoid unnecessary suffering.
3. Vertical dressing is more advantageous than horizontal dressing

Part II. Matching (1pt each)

A	**B**
1. Approved for human consumption	A. Meat below standard, but not hazardous
2. Totally condemned	B. Jaundice
3. Inferior meat	C. Infected with contagious zoonotic disease
4. HACCP	D. No disease or abnormal conditions detected
5. Detained	E. Making Unconcisiousness
6. Stunning	F. System installed in industry to control hazard
	J. animal comes from quarantine stations.

Part III multiple choice(1pt each)

1. Which of the following is the correct **sequence of postmortem inspection**?

A. Incision ⇨ Palpation ⇨ Visualization ⇨ judgment

B. Visualization ⇨ Palpation ⇨ Incision ⇨ judgment

C. Palpation ⇨ judgment ⇨ Incision ⇨ Visualization

D. Incision ⇨ Palpation ⇨ judgment ⇨ Visualization

2. Which one is **not objective** of post-mortem inspection of meat?

A. To detect diseases which could not be detected during ante-mortem inspection?

B. To pass carcases or organs which are fit for human consumption

C. To supervise and control the hygienic dressing of carcases.

D. To passed any meat fit for human consumption.

3. If the animal is infected with **chronic intestinal tuberculosis** which lymph node should be incised?

Mesenteric lymph nodes

A. Bronchial lymph nodes

B. Meditational lymph nodes

C. Portal lymph node

4. When you make longitudinal incision at the ventral aspect of the tongue, what decisions have you passed if you detect 3-5 Cysts per incision of *C. bovis*?

A. Approved for human consumption

B. Totally condemned

C. Conditionally approved for human consumption

D. Inferior meat

5. Which principle of food preservation involves inhibiting the growth and multiplication of microorganisms?

a) Inhibition principle

b) Killing principle

c) Fermentation principle

d) Salting principle

6. Which method is used to lower the pH of food and prevent the growth of spoilage and pathogenic bacteria?

a) Smoking

b) Drying

c) Addition of acids

d) Freezing

7. Which method of food preservation involves removing the free water necessary for enzyme and microbial activity?

a) Salting

b) Chilling

c) Drying

d) Pasteurization

8. What is the purpose of canning in food preservation?

a) To create an unfavorable condition for microbial growth

b) To add flavor to the food

c) To reduce the water activity of the food

d) To provide a long shelf life by rendering the food sterile

Test III Short Answer Questions (2pts each)

1. Define inspection of food animal products?
2. Mention judgments of post mortem inspection?
3. Which body systems must be inspected in postmortem inspection?
4. Mention postmortem inspection methods?
5. Write the conditions of carcass to be totally condemned?
6. What finding you expect when postmortem inspection done on heart?
7. What is inferior meat?

Note: Satisfactory rating – 35 points **Unsatisfactory - below 35 points**

You can ask you teacher for the copy of the correct answers.

Operation sheet 2:

2.1. Post-mortem inspection

A. Tools and equipments: Required PPE (gown, boots, gloves, head cover, apron), meat, knife, blade, well equipped abattoir, note book, weight balance, adequate light)

B. Procedures

I. Wear clean PPE
II. Inspect Structures of the head (Organs (viscera) in the thoracic (chest) cavity, Viscera in the abdomen, lymph nodes……)
III. Palpate: lymph nodes
IV. Incise: (Muscles, Tongue, lymph nodes…)
V. Carcass inspection
VI. Pass judgment descion

LAP test-2		

Name_____ID_____Signature_____Date_____

Time started: 2:30 Time finished: 3:30 local time

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

Task-1: Perform Post-Mortem Examination

LG #19	LO5. Conduct Sampling and quality assessment for food of animal origin

Instruction sheet 5

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

- Identification of PPE , sampling materials and equipment
- Sampling of animal origin food
- Recording of sample information
- Quality assessment of meat, milk, eggs and honey
  - ✓ physical test
  - ✓ chemical test
  - ✓ Microbial test
- Egg and honey collection, handling and grading
- Record and Interpret 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:

- Sampling materials and equipment are identified, maintained and used according to the enterprise guide lines
- PPE clothing and equipment are identified, maintained and used according to the enterprise requirements
- Samples of milk, egg, honey, organs, other tissues and fluid samples are taken if necessary, where appropriate, and prepared in accordance with appropriate standard methods, institutional and laboratory requirements
- Information is recorded and reported according the enterprise guidelines
- Materials, equipment and tools used for quality assessment of meat, milk, eggs and honey are identified, maintained and used according to the enterprise guide lines

- Basic physical, chemical and microbial test of meat and milk is performed according to the enterprise guide lines under supervision
- Egg collection, handling, and grading are performed based on the enterprise procedures and regulation under supervision.

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
4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do to LAP Test

Information Sheet 5

5.1. Identify, use and maintain sampling materials and equipment

I. 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.

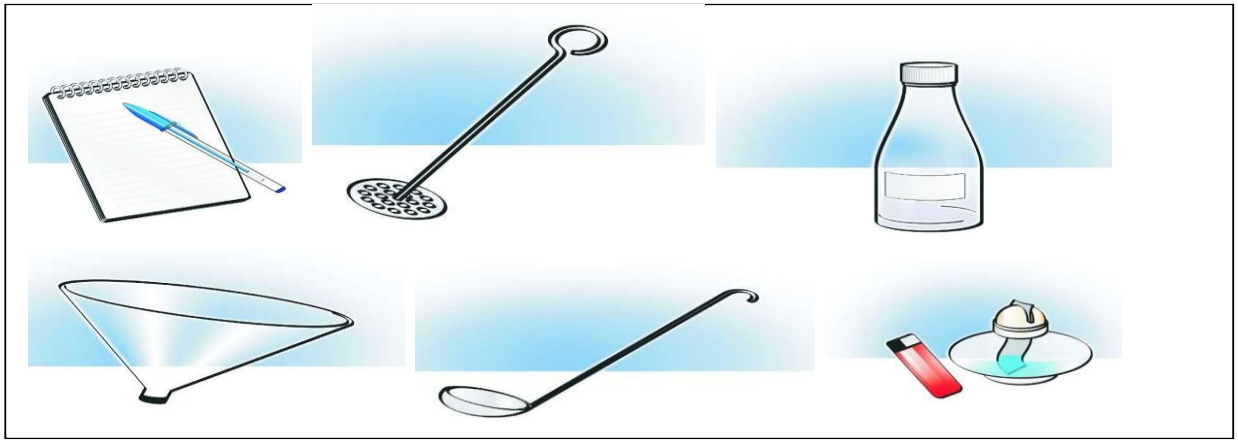


Figure 5.1: Milk sampling materials (Pen and note book, plunger, bottle, funnel, Dipper and sprint flame and lighter)

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.

II. Honey Sampling Equipments

Pure honey is a source of many benefits. 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

a) By pipetting honey cell using micropipette/dropper

b) By extracting honey using a honey extractor

c) By squeezing honey from combs

Apparatus such as

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

III. 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)

IV. Meat sampling equipments

There are various types of meat sampling equipment available for different purposes. Here are some common types:

- Meat Thermometer: A meat thermometer is used to measure the internal temperature of meat to ensure it is cooked to the appropriate level of doneness and safe for consumption. There are instant-read thermometers and probe thermometers that can be inserted into the meat while it is cooking.
- Meat Tenderizer: A meat tenderizer is a tool used to break down the connective tissues in meat, making it tenderer and easier to eat. It can be in the form of a mallet or a device with sharp blades or needles.
- Meat Injector: A meat injector, also known as a flavor injector, is used to inject marinades, brines, or other flavorings directly into the meat. This can enhance the taste and juiciness of the meat.
- Meat Grinder: A meat grinder is a device used to grind or mince meat into smaller pieces. It consists of a hopper, a feeding tube, and a blade or grinding mechanism. Meat grinders are commonly used in butcher shops or for home meat processing.
- Meat Slicer: A meat slicer is a machine used to slice meat into thin, uniform slices. It is commonly used in delis, restaurants, or meat processing facilities. Meat slicers can be manual or electric.
- Meat Sampling Kit: A meat sampling kit typically includes various tools and containers used for collecting meat samples for testing or analysis. It may include sterile swabs, sampling bags or containers, gloves, and labels for proper sample identification.
- Meat Hooks: Meat hooks are used for hanging and suspending meat during processing or storage. They are typically made of stainless steel and come in various sizes and shapes to accommodate different cuts of meat

5.1.1. Identify, use and maintain PPE clothing and equipment

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.

1. 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.

2. 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.

3. 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, and reusable long-sleeved one-piece cloth coveralls are most commonly used but higher risk situations

may require a less permeable, disposable, long- sleeve done-piece or similar coverall. One of the more protective materials maybe needed when there is a splash hazard, particularly of injurious or corrosive liquids.

- **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 collecting and cutting tissues that may be contaminated with a disease agent of high zoonotic risk.

4. Hand Protection: includes disposable gloves or gloves that can be disinfected. **Nitrile gloves:** Protect against solvents, chemicals, fats, and petroleum products while providing excellent resistance to cuts, snags, punctures, andabrasions

5. Head protection may include: Hard hat, Hood, Disposable head cover/hair bonnet

6. Hearing protection includes: Ear muffs, Disposable ear plugs Reusable ear plugs

7. 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 orover boots
- Safety boots with steel toes and midsoles provide extra protection from puncture wounds and crushing

5.2. Sampling of animal origin food

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.

5.2. 1. Milk Sample Collection

Milk is a yellowish-white non-transparent liquid. Fresh milk has a pleasant soft andsweet 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). 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 aluminum foil of adequate strength (sterile and non-sterile) and suitable plastic bags, with appropriate methods of closure, may be used.

A. 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 inbulk tank milk.

5.2. 2. 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 nectar. The sugar composition in nectar, with principal sugars being fructose, glucose and sucrose, is typical from the plant species.Most nectar consists mainly of fructose and glucose. Its sugar concentration actually depends on the different climatic factors such as temperature, soil, humidity andseason. Honey is carbohydrate rich syrup. It is not only a popular sweetener but also a folk medicine used since ancient time.

Handheld Honey Refractometer is simple to operate and provides quick, accurate measurements for honey sampling. This unique refractometer features three scales for honey moisture, brix, and baume. It also has automatic temperature compensation (ATC) and comes with a one year warranty.

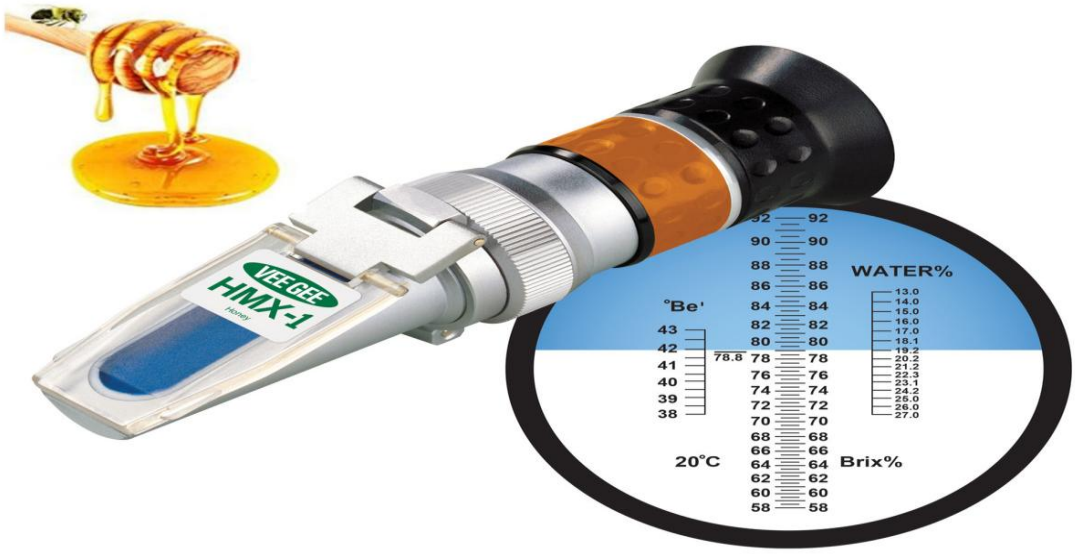


Figure 5.2. Honey Refractometer

5.2. 3. Egg sample Collection

Eggs and egg products are important commodities in international trade. Eggs and egg products are subdivided into (I) 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.

Sampling Plans

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

5.2.4. Meat sample collection

If you need to collect a sample of meat for testing or analysis, here are some general guidelines to follow:

- Select the sampling method: The method of collecting a meat sample depends on the specific purpose or analysis you need to perform. Some common methods include grab sampling (randomly selecting a portion of meat), composite sampling (combining several randomly collected samples), or targeted sampling (selecting specific areas or portions of the meat).
- Gather the necessary equipment: You'll need clean, sterile containers or bags to collect the meat sample. Make sure they are appropriate for the type and size of meat you're sampling. Additionally, wear appropriate personal protective equipment (PPE) such as gloves to maintain hygiene and prevent cross-contamination.
- Prepare the sampling area: Clean and disinfect the area where you'll be collecting the meat sample to minimize the risk of contamination. This is particularly important if you're collecting samples from different sources or locations.
- Randomize the sampling process: If you're conducting a random sampling, ensure that the samples are taken from different areas of the meat or different meat products to obtain a representative sample. This helps to ensure the accuracy and reliability of the analysis.
- Collect the sample: Use clean utensils or tools to collect the meat sample. For solid cuts of meat, you can use a sterile knife or scalpel to cut a small piece. For ground meat or minced meat, scoop a representative portion using a clean spoon or spatula.
- Place the sample in a container: Immediately transfer the collected meat sample into a clean, sterile container or bag. Ensure that the container is properly labeled with relevant information such as the date, time, location, and any other details required for identification and tracking.
- Handle and store the sample appropriately: Handle the meat sample with care to prevent contamination. If the sample requires specific storage conditions (e.g., refrigeration or

freezing), ensure that you adhere to the recommended storage guidelines to maintain the quality and integrity of the sample.

5.3. Recording of sample information

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 as follow.

- **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 asnearly 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.

5.4. Quality assessment of meat, milk, eggs and honey

A. Maintaining materials, equipment and tool used for quality assessmentof 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

B. Maintaining materials, equipment and tool used for quality assessmentof egg

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 andyolk 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)

C. Maintaining materials, equipment and tool used for quality assessmentof honey

When it comes to assessing the quality of honey, several materials, equipment, and tools are commonly used. These include:

1. Honey Sampling Tools:
   - ✓ Honey dipper or spoon: Used to collect honey samples from jars or containers.
   - ✓ Honey thief or sampler: A tube-like tool designed to extract honey samples from different depths of a container.
2. Containers and Jars:
   - ✓ Glass jars: Used for storing honey samples and preserving their quality for analysis.
   - ✓ Sample bottles: Small, airtight containers used specifically for collecting honey samples.
3. Laboratory Equipment:
   - ✓ Refractometer: Measures the moisture content in honey, expressed as the percentage of water.
   - ✓ Polarimeter: Determines the purity and authenticity of honey by analyzing its optical rotation.

- ✓ pH meter: Measures the acidity or alkalinity of honey, indicating its stability and freshness.
- ✓ Moisture analyzer: Utilized to determine the moisture content of honey accurately.
- ✓ Ultraviolet-visible (UV-Vis) spectrophotometer: Used to analyze the color and transparency of honey.
- ✓ Microscope: Enables the examination of honey for the presence of foreign particles, pollen, or crystallization.
- ✓ Centrifuge: Separates impurities or sediment from honey during analysis.

4/. Chemical Reagents:

- ✓ Fehling's solution: Used to test for reducing sugars in honey.
- ✓ Benedict's solution: Similar to Fehling's solution, used to detect reducing sugars.
- ✓ Lugol's solution: Used to identify starch in honey.
- ✓ Aniline chloride: Used to test for the presence of artificial or added sugars.

5. Miscellaneous Tools:

- ✓ Honey refractometer chart: Provides a reference for determining the moisture content based on refractometer readings.
- ✓ Sieve or strainer: Filters out impurities or debris from honey samples.
- ✓ Hot water bath: Used to warm crystallized honey for viscosity measurement.

D. Quality assessment of milk, eggs and honey

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.

E. Quality assessment of milk

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 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.

5.4.1. 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:

- ✓ **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.

Table 5.1: 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	Milk produced under unhygienic conditions

- ✓ **Off-flavors from feeds**

Garlic, onion, beets, bad silage, certain plants and pastures can cause off-flavours to milk, Absorption of off-flavors from air, milk containers etc. Strongly smelling paints, disinfectants and other chemicals should not be handled and stored in places where the dairy animals are kept and milked. 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. Storage of milk together with fruits and fish also causes off-flavors to milkabnormal smell and/or taste and interpretation.

Table 5.2: Odor 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

- ✓ **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 beeasily 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.

5.4.2. Chemical test of milk

Chemical examination of milk is an important aspect of quality control in the dairy industry. Milk is a complex product composed of various constituents such as water, fat, proteins, lactose (milk sugar), minerals (salts), pigments, enzymes, vitamins, phospholipids, and gases1. The residue left when water and gases are removed is called the dry matter or total solids content of the milk1. Chemical examination of milk involves analyzing its composition and properties. Some common tests include:

- ✓ **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 result 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.

- ✓ **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:

- By using indicator strips

- By using pH meter

✓ **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 checking whether the milk has high acidity (pH < 5.8). High-acid milk should be rejected. The test allows identifying 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. If the milk is of good quality, there will be no coagulation, clotting or precipitation. If themilk has become acidic (pH below 6.4) it will flocculate. To quickly see whether milk is acidic, you can use a litmus paper.

✓ **Phosphatase test for pasteurized milk**

Pasteurization is an essential process of making milk safe and free from pathogens. Alkaline phosphates are an enzyme which is naturally present in milk, but is destroyed at a temperature just near to the pasteurization temperature. Alkaline phosphates 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. The 30-minute test will reveal any serious fault in pasteurization, but to enable minorerrors to be detected, readings shall be taken after further incubation for 90 minutes.

Table5.3: Interpretation results of Phosphatase test

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

5.4.3. 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, rapidresults.

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 4: 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

B. Quality Assessment of Eggs

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. some significant egg qualities are egg size, egg shape, shell color, shell condition, Eggshell thickness and strength, albumen quality, yolk quality, air cell quality, etc.

- **Quality parameters of egg**

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, andair 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

- ✓ **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 is 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.

I. Tests used Egg for Freshness

a. The Sink or Float Test: A science experiment may have done in school; this freshness test is not only simple but acan tell the approximate age of the egg. The science behind this is that as eggs age, the shell becomes more porous, allowing airto flow through. Tmore 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.

b. 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.

C. 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.

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

- **Honey Quality parameters**

Honey quality parameters refer to the characteristics and properties used to assess the overall quality of honey. Here are some commonly considered parameters:

- ✓ Moisture Content: Honey should have low moisture content, typically below 18%. Excessive moisture can lead to fermentation, degradation, and spoilage.
- ✓ Color: The color of honey can vary widely, ranging from light amber to dark brown. It is influenced by factors such as the nectar source and processing methods. The color can indicate the floral source and the presence of impurities or processing defects.
- ✓ Aroma and Flavor: Honey has a distinct aroma and flavor that can vary depending on the nectar source. The aroma can be floral, fruity, or herbal, while the flavor can range from mild to strong and can have hints of specific flowers or fruits.
- ✓ Sugar Composition: Honey primarily consists of different sugars, such as fructose, glucose, and sucrose. The ratio of these sugars can affect the taste, texture, and crystallization properties of honey.
- ✓ Acidity/pH Level: Honey is naturally acidic, with a typical pH range of 3.2 to 4.5. The acidity level can impact the taste, preservation, and microbial stability of honey.
- ✓ Enzymes and Pollen Content: Honey contains various enzymes and pollen grains derived from the nectar source. The presence and type of enzymes and pollen can provide information about the honey's botanical origin and processing techniques.
- ✓ Crystallization: Honey tends to crystallize over time, forming sugar crystals. The rate and type of crystallization can depend on factors such as the floral source and storage conditions.
- ✓ Adulteration: Honey can be susceptible to adulteration with other sweeteners or low-quality honey substitutes. Testing for adulteration involves analyzing parameters such as pollen content, sugar composition, and chemical markers.

- ✓ Microbiological Quality: Honey should have low microbial counts to ensure safety and prevent spoilage. High-quality honey typically has low levels of yeasts, molds, and bacteria.

I. Honey quality Testing

These parameters can be accessed through various laboratory tests and sensory evaluations to determine the quality and authenticity of honey. It's important to note that honey quality standards and regulations may vary between countries or regions, so specific parameters and limits may differ accordingly.

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

5.5. Egg and Honey collection handling and Grading System

An egg and honey collection handling and grading system can be designed to streamline the process of collecting, handling, and grading eggs and honey. Such a system can help ensure the quality, safety, and traceability of these products.

5.5.1. Egg Collection, Handling and Grading System

- **Egg Collection**

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, forklifts 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_____

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.**	

✓ **Egg 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.

- **Refrigeration:** Eggs ust be cooled to a core temperature of 45 ˚F (70c). Eggs held prior to processingmust 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 is 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.
  - ❖ Storage of Eggs
    - ➢ Store eggs small end down in an egg carton to keep the air cell stable.
    - ➢ Date carton so you can use or sell the oldest eggs first and rotate your extraeggs. Try to use or sell all eggs before they are three weeks old.
    - ➢ Store eggs at 50-55ºF and 70-75% relative humidity.
    - ➢ Never store eggs with materials that have an odour. Eggs will pick up the odours ofapples, fish, onions, potatoes and other food or chemicals with distinct odours.
    - ➢ Never hold eggs at or above room temperature or at low humidity more thannecessary.
    - ➢ Leaving eggs in a warm, dry environment will cause interior quality to dropquickly.
- **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 anumber of classes.

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.

- **Methods of determining quality of egg**
  - **Candling of Egg**

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

I. Holding the egg before a suitable light at about elbow level with the air cell upward.
II. 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.

D. Quality assessment of meat

The quality assessment of meat involves evaluating various factors to determine its freshness, safety, and overall quality. Here are some materials, equipment, and methods commonly used for assessing meat quality:

- Sensory Evaluation:
  - ✓ Visual assessment: Visual inspection of meat appearance, including color, marbling, and surface abnormalities.
  - ✓ Odor assessment: Smelling the meat to detect any off-putting or abnormal odors that could indicate spoilage or contamination.
  - ✓ Texture evaluation: Assessing the firmness, tenderness, and juiciness of the meat by touch or chewing.
- pH Measurement:
  - ✓ pH meter: Determines the pH value of meat. A decrease in pH can indicate meat spoilage or quality deterioration.
- Microbiological Analysis:

- ✓ Swabs or sterile sampling tools: Used to collect samples for microbiological testing.
- ✓ Petri dishes: Containers used to culture and grow microorganisms from meat samples.
- ✓ Agar plates and media: Nutrient-rich substances used to support the growth of specific bacteria, such as total viable count, coliforms, or specific pathogens.
- ✓ Incubator: Maintains controlled temperature conditions necessary for bacterial growth in the laboratory.
- ✓ Sterilization equipment: Autoclaves or sterilizers used to sterilize laboratory tools and media.

- Chemical Analysis:
  - ✓ Fat content determination: Soxhlet extraction or acid hydrolysis methods to extract and quantify fat content.
  - ✓ Protein analysis: Kjeldahl method or spectrophotometric techniques to measure protein content.
  - ✓ Moisture analysis: Drying methods, such as oven drying or Karl Fischer titration, to determine moisture content.
  - ✓ Nitrite and nitrate analysis: Colorimetric or spectrophotometric methods to assess the levels of nitrites and nitrates, commonly used in cured meats.
  - ✓ Residual drug or pesticide analysis: Techniques such as liquid chromatography-mass spectrometry (LC-MS) or enzyme-linked immunosorbent assay (ELISA) to detect and quantify residues of drugs or pesticides.
- Instrumental Analysis:
  - ✓ Texture analyzer: Measures the mechanical properties of meat, including tenderness, chewiness, and juiciness.
  - ✓ Colorimeter or spectrophotometer: Quantifies meat color attributes such as lightness, redness, and yellowness.

- ✓ Water activity meter: Measures the water availability in meat, which is related to microbial growth and product stability.

5.5.1. Honey collection, handling and Grading System

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.

- **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.

- **Grade A** is the quality of extracted honey that meets the applicable requirements and has a minimum total score of 90 points.
- **Grade B** is the quality of extracted honey that meets the applicable requirementsof Table A and has a minimum total score of 80 points.
- **Grade C** is the quality of extracted honey that meets the applicable requirements of Table A and has a minimum total score of 70 points.

5.6. Record and Interpret results

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 is 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.

5.6.1. 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.

5.6.2. Interpret Laboratory Results

The selection of diagnostic laboratory parameters depends on greatly on the medical problem in question, but in the lab often sees many different tests ordered on each single sample. Ordering to many tests in an uncritical manner will not necessary provides 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:

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

5.6.3. 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)

Self-Check – 5	

Name_____ ID_____signature_____ date_____

Directions: Answer all the questions below according to the instruction

Part I: Write True if the statement is correct and False if the statement is incorrect(1pt each)

1) Goggles protect eyes from fluids splashed during cleaning anddisinfection activities.
2) Respirators either purify the air or supply fresh air.
3) Egg sampling equipment is used to collect egg sample for judging its quality
4) Sampling protocols should meet scientifically recognized principles and procedures.
5) Milk samples may be collected individually from affected quarters.
6) **"**Honey adulteration" refers to the act of adding some foreign substances into purehoney
7) Sampling should be performed by an authorized, properly trained, person.
8) Sample for microbiological examination is taken before other sampling.
9) Egg sample may be frozen, liquid, and powdered products.
10) After sample collection the sample should be labeled.
11) During sample collection date and time of collection should be noted.
12) The lactometer test serves as a quick method to determine adulteration of milk byadding water.

Part II multiple choice(1pt each)

1. Which method is commonly used to determine the quality of a shell egg?
   a. Grading
   b. Spectroscopy
   c. Honey refractometer
   d.Candling
2. What is the purpose of candling a shell egg?
   a. To measure the size of the air cell
   b. To determine the weight of the egg

c. To evaluate the condition of the yolk

d. To assess the color of the shell

3. What is the significance of the air cell size in a shell egg?

a. It indicates the freshness of the egg.

b. It determines the grade of the egg.

c. It affects the viscosity of the albumen.

d. It indicates the presence of cracks in the shell.

4. Which factor is NOT considered in grading the exterior quality of an egg?

a. Soundness of the shell

b. Cleanliness of the shell

c. Color of the shell

d. Viscosity of the albumen

5. Which equipment is commonly used to test the quality of honey?

a. Flashlight

b. Beaker

c. Spectroscopy

d. Glass rod

6. What is the main problem that can affect the quality of honey during harvesting?

a. Excessive use of smoking materials

b. Inadequate production knowledge

c. Poor post-harvest handling system

d. Inappropriate storage containers

7. What is the minimum total score required for Grade A extracted honey?

a. 70 points

b. 80 points

c. 90 points

d. 100 points

8 What should be recorded in a laboratory's final report of test results?

a. Patient's identification number and address

b. Tests performed and specimen source

c. Test report date and interpretation

d. All of the above

9. Which test is used to observe and record the overall quality of milk using the senses of sight and smell?

a. Alcohol test
b. Lactometer test
c. Organoleptic test
d. pH test

10. What does a pink color in milk indicate during the organoleptic test?
    a. Contamination with blood
    b. Adulteration with water
    c. Presence of mastitis
    d. Production under unhygienic conditions
11. Which test is used to determine the adulteration of milk by adding water?
    a. Alcohol test
    b. Lactometer test
    c. Organoleptic test
    d. pH test

Part III shot answers

1. List different type of honey sampling methods
2. Discuss the sampling procedure for:
    A. Milk
    B. Honey
3. What are the considerations into account during sample collection?
4. List materials and equipments used to assess the quality of
    a) Milk.
    b) honey

Operation sheet 3

3.1 Aseptically collecting milk sample

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

B. Procedure:

i. Wash your hands and put on new disposable gloves.
ii. 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.
iii. 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.
iv. 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.
v. Discard 3 to 4 streams of milk to minimize risk of contamination of the sample with bacteria in the teat canal.
vi. 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.
vii. 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.
viii. 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.

3.2. Procedure of collecting bulk tank milk samples

A. Materials: (Gloves, Water, soap, Marker universal bottle, ice box, dipper, sterilesyringe)

B. Procedure:

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

3.3. Aseptically collecting Honey sample

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

B. Procedure:

i. Put on a new pair of nitrile gloves prior to sampling each set of colonies as this prevents cross-contamination between apiaries.

ii. 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 tothe bottom of the cell and rotate the stick all the way around the cell scraping the bee bread as you go.

iii. 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.

iv. 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.

v. The sampling sticks and gloves can be disposed of in the trash and should not be used again.

vi. Once all colonies have been sampled, close the vial, and label it with the corresponding sample ID.

3.4. Milk density test

A. Materials (Measuring cylinder 200-250 ml, Lactometer)

B. Procedure

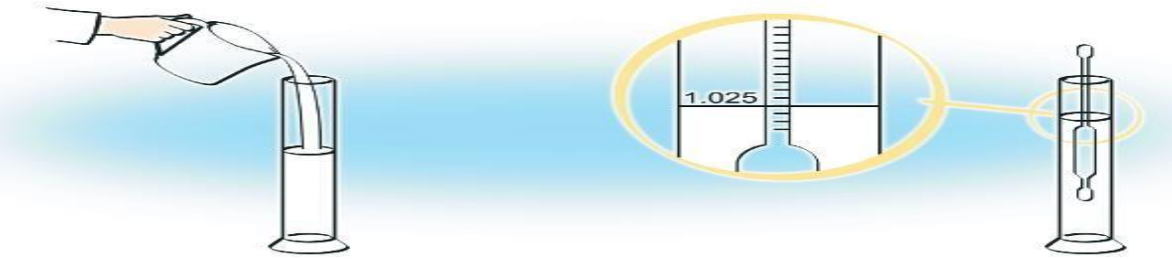
i. First, ensure that the milk temperature is about 20°C. Hot milk should be left to cool at room temperature for at least 30 minutes. If the milk was cooled below 10°C, warm it to 40°C, and then cool it to 20°C.

ii. Mix the milk sample and gently pour about 200 ml into a measuring cylinder. Slowlydip 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.

iii. Extraneous matterProcedure

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 asat the bottom of the container;
3. The milk sample can also be centrifuged for few minutes to get the extraneousmatter



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
-

3.5. Aseptically test the freshness of milk by using alcohol test

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

B. Procedure

i. Put equal volumes of milk and 68% alcohol in a test tube (e.g. 2 ml of milk in 2 mlof 68% alcohol).

ii. Invert the test tube several times, keep your thumb pressed tightly over the openend of the tube.

iii. Examine the tube to see whether the milk has coagulated. If it has, fine particlesof curd will be visible.



3.6. PH determination of milk

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

B. Procedure

i. Indicator paper strips are made by soaking strips of absorbent paper in a suitable indicator and drying them
ii. A rough estimate of pH is obtained by dipping a strip of the prepared paper in milk and observing the colour
iii. 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
iv. Both narrow and wide range ready-made indicator papers are available
v. commercially over the pH range 2.0 to 10.5

3.7. PH determination of milk

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

B. Procedure

i. Take 50 ml of milk sample at 30°C in a 100 ml glass beaker
ii. 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 inthe beaker
iii. Read the pH of the milk after 30 sec

3.8. test aseptically test freshness of milk

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

B. Procedure

i. Transfer 5 ml of the sample to the test tube and smell for any acidic flavour
ii. Place the tube in a boiling water bath and hold for about 5 minutes, and smell again for any acidic flavour
iii. 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
iv. 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





3.9. Pasteurized milk sampling

A. Material: 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 and 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 colorless; when viewed through a 25 mm cell in the all-purpose comparator, it should give a reading of less than10 on the disc.

B. Procedure

i. Take 10 ml of the buffer substrate solution into test-tubes marked at 10 ml andbring to 37 to 38°C in a water-bath
ii. 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
iii. Prepare in the same way a blank from a boiled milk of the same type as thattest.
iv. Incubate all the tubes at 37-38°C
v. Read the yellow colour after 30 minutes, return to the bath, and take a second reading after incubation for a further 90 minutes
vi. The yellow colour is read in a Lovibond all-purpose comparator on a resazurin stand, fitted with the disc calibrated in microgram p-nitrophenol
vii. Readings are taken by looking down on to the two apertures with the comparator facing a good source of north daylight; the disc is resolved until the sample is matched; readings falling between two standards are recorded to the nearest reading

3.10 CMT **test**

A. Material: Milk, CMT Paddle. The CMT paddle has four shallow cups marked A, B, C, and D, The CMT solution

B. Procedure

i. 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.
ii. An equal amount of CMT reagent is added to each cup in the paddle.
iii. The paddle is then rotated in a circular motion to thoroughly mix the contents.The mixing should not last more than 10 seconds.
iv. 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 amountof 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 disappearwith a continued rotation of the paddle.

1= weak positive. There is a distinct thickening of the mixture, but there is no tendencyto 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

3.11. Floating of egg

A. Materials: Egg, Bowl, and Cold water.

B. Procedure

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

ii. Egg can do one of three things and each will determine its freshness. If it sinks to thebottom, turns on its side, and stays there, it is very fresh.

iii. If the egg sinks but floats at an angle or stands on end, the egg is a bit older (a weekto two weeks old) but still okay to eat.

iv. 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 inthe water if it sinks, it's good; if it floats, it's too old.)

LAP Test 3

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 for each task. The project is expected from each student to do it.

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

Task1. Perform milk sample collection.

Task 2. Perform bulk milk sample collection.

Task 3. Perform bee bread/honey sample collection.

Task4. Perform lactometer/milk density test

Task 5. Perform alcohol test

Task 6. Demonstrate pH of milk using calibrated pH meter

Task 7. Demonstrate pH of milk using indicator paper

Task 8. Perform clot on boiling test

Task 9. Pasteurized milk sampling

Task 10 Demonstrate California Mastitis Test

Task 11. Perform Floating of egg

LG #20	LO6 -Perform community awareness on veterinary public health issues

Instruction sheet 6

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

- Veterinary public health guidelines and procedures
- Veterinary public health awareness activities
- Operate and use relevant equipment and materials
- Addressing current public health issues

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:

- Structure and finalize Plans of veterinary public health accordance with guidelines and procedures.
- Conduct Veterinary public health awareness activities using effective message development and delivery techniques.
- Operate correctly relevant equipment and materials to assist the community in understanding the activities.
- Address Current public health ***issues*** are according to international, national or enterprise policy procedures and guidelines.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below and try to understand what are being discussed.
3. Ask your teacher for assistance if you have hard time understanding them.
4. Read the information written in the information Sheets
5. Accomplish the Self-checks.
6. Perform Operation Sheets

Information Sheet 6

6.1 . Veterinary public health guidelines and procedures

Veterinary public health guidelines and procedures are important in ensuring the safety of both animals and humans. These guidelines provide a framework for addressing issues related to zoonotic diseases, food safety, antimicrobial resistance, and other related topics. Some examples of veterinary public health guidelines and procedures include:

1. **Infection control, prevention, and biosecurity guidelines**: These guidelines provide a roadmap for safeguarding patients, staff, and clients from avoidable exposure to infectious pathogens.
2. **Food safety guidelines**: These guidelines aim to ensure that food products are safe for human consumption by minimizing the risk of food-borne illnesses.
3. **Antimicrobial resistance guidelines**: These guidelines provide recommendations for the responsible use of antimicrobials in the livestock industry to reduce the risk of antimicrobial resistance.
4. **Animal welfare guidelines**: These guidelines aim to promote the welfare of animals by providing recommendations for their care and treatment.
5. **Surveillance and monitoring guidelines**: These guidelines provide recommendations for monitoring and surveillance of zoonotic diseases, food safety, and antimicrobial resistance.

These are just a few examples of veterinary public health guidelines and procedures. By following these guidelines, veterinarians can help ensure the well-being of both animals and humans.

6.2. Veterinary public health awareness activities

Traditionally the veterinary public health course was primarily focused on meat inspection, but now it has been expanded to include: Quality assurance of animal-based products to meet consumer expectations; Knowledge on causes, epidemiology and control of food borne zoonotic and emerging diseases; adverse effects of agricultural and other human activities on food quality, animal welfare, human health and the environment. These are just a few examples of veterinary

public health awareness activities. By raising awareness about zoonotic diseases, food safety, antimicrobial resistance, and other related topics, these activities contribute to the well-being of both humans and animals.

6.2.1. Community awareness activity delivery techniques

Veterinary public health is a crucial field that addresses issues affecting both human and animal health. To create awareness on veterinary public health, the following are some of the ways that can be employed:

1. **Social media campaigns**: Social media platforms such as Facebook, Twitter, and Instagram can be used to create awareness on veterinary public health issues. This can be done by sharing informative posts, info graphics, and videos on zoonotic diseases, food safety, and antimicrobial resistance.
2. **Public lectures and seminars**: Public lectures and seminars can be organized to educate people on the importance of veterinary public health. These events can be held in schools, universities, community centers, and other public places.
3. **Radio and television programs**: Radio and television programs can be used to create awareness on veterinary public health issues. This can be done by airing informative programs on zoonotic diseases, food safety, and antimicrobial resistance.
4. **Printed materials**: Printed materials such as brochures, posters, and flyers can be distributed to create awareness on veterinary public health issues. These materials can be distributed in schools, universities, hospitals, clinics, and other public places.
5. **Collaboration with stakeholders**: Collaboration with stakeholders such as government agencies, non-governmental organizations (NGOs), and private sector organizations can help to create awareness on veterinary public health issues. This can be done by organizing joint campaigns and events.

6.3. Operate and use relevant equipment and materials

6.3.1. Principles needed to maximize the effectiveness of any awareness creation

To maximize the effectiveness of any awareness creation, education, or training, it is important to consider the following principles:

1. **Succinct messaging**: The more concise and clear the message, the more likely it will be read, understood, and acted upon.
2. **Active voice**: Whenever possible, use the active voice in your communication to make it more engaging and impactful[1].
3. **Emoticons sparingly**: Use emoticons sparingly to add a touch of emotion or emphasis to your message[1].
4. **Pre- and post-assessment**: Conduct pre- and post-assessments to evaluate the change in learning before and after training.
5. **Knowledge reinforcement**: Incorporate knowledge checks, quizzes, or observations during training to reinforce learning and gather evaluation data[2].
6. **Multichannel approach**: Utilize various communication channels such as social media, radio, television, print materials, and community events to reach a wider audience.
7. **Collaboration**: Collaborate with stakeholders such as government agencies, NGOs, and private sector organizations to amplify the impact of awareness campaigns.

6.3.1. Relevant equipment and materials

To create awareness in the community about veterinary public health issues, you can utilize various equipment and materials. Here are some examples:

1. **Printed materials**: Brochures, posters, and flyers can be designed and distributed to raise awareness. These materials can contain information about zoonotic diseases, food safety, antimicrobial resistance, and the importance of veterinary public health.
2. **Audiovisual aids**: Videos, presentations, and infographics can be created to convey information effectively. These aids can be used during public lectures, seminars, and community events.
3. **Social media**: Platforms like Facebook, Twitter, and Instagram can be utilized to reach a wider audience. You can create engaging posts, share informative content, and interact with the community through comments and messages.

4. **Community events**: Participating in festivals, fairs, parades, and other community celebrations provides an opportunity to engage with the public directly. Setting up tables with promotional and informational items can help attract attention and generate interest.
   Remember that creating awareness is an ongoing process that requires consistent effort and engagement. By utilizing these equipment and materials effectively, you can contribute to raising awareness about veterinary public health issues in your community.

6.4. Addressing current veterinary public health issues

Veterinary public health is an important field that addresses issues affecting both human and animal health. It plays a crucial role in improving animal health and safeguarding public health. These issues are further compounded by factors such as livestock intensification, shifts in land use and food supply systems, increased global travel and trade, climate change, poverty, and poor health systems. Addressing these challenges requires collaborative efforts using a One Health approach that recognizes the interconnectedness of human, animal, and environmental health some of the key areas of focus in veterinary public health include:

1. **Zoonoses**: These are diseases that can be transmitted between animals and humans. Over 60% of known human infectious pathogens are zoonotic in nature. Examples of zoonotic diseases include COVID-19, SARS, highly pathogenic influenza, Ebola, rabies, anthrax, brucellosis, and zoonotic tuberculosis
2. **Food Safety**: Unhealthy animals that produce food products or directly enter the food chain can pose a public health threat. Food-borne zoonoses such as salmonella and E. coli are linked to livestock production practices and food contamination during processing
3. **Antimicrobial Resistance (AMR)**: AMR is a global threat to public health, food security, animal production, and livelihoods. Misuse and overuse of antimicrobials in the livestock industry contribute to the build-up of resistance throughout the food chain
4. **Outbreak**: An outbreak refers to the occurrence of cases of a particular disease in a population or geographical area that is greater than what is normally expected. It can be localized or spread across multiple regions. Outbreaks can be caused by various factors, including infectious diseases, food borne illnesses, or even chemical exposure.

5. **Natural Disaster**: A natural disaster refers to an extreme event or phenomenon that occurs naturally and causes significant damage, destruction, or loss of life. Examples include earthquakes, hurricanes, floods, wildfires, and tsunamis. Natural disasters can disrupt infrastructure, displace populations, and lead to various health risks, including injuries, waterborne diseases, and mental health challenges.

6. **Pandemics**: A pandemic is an outbreak of a disease that occurs over a wide geographic area, often affecting multiple countries or continents. Unlike an epidemic, which is limited to a specific region, a pandemic has global implications. Pandemics typically involve a novel infectious agent to which a large proportion of the population has little or no immunity. The most notable example in recent history is the COVID-19 pandemic caused by the SARS-CoV-2 virus, which has had far-reaching health, social, and economic consequences worldwide.

Self-Check – 6	**Written test**

Name_____ ID_____signature_____ date_____

Directions: Answer all the questions below according to the instruction

Part I: Write True if the statement is correct and False if the statement is incorrect(1pt each)

1. Veterinary public health guidelines and procedures are important in ensuring the safety of both animals and humans
2. Antimicrobial Resistance is a global threat to public health, food security, animal production, and livelihoods

Part II Short Answer

1. List and describe 5 Community awareness activity delivery techniques?
2. List and describe 5 relevant equipment and materials for community awareness in activities
3. List and describe 4 Principles needed to maximize the effectiveness of any awareness creation

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