ANIMAL HEALTH CARE SERVICES LEVEL- IV

BASED ON MARCH 2018, VERSION 3 OCCUPATIONAL STANDARDS

MODULE TITLE: CARRYING-OUT VETERINARY PUBLIC HEALTH ACTIVITIES

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East Africa for Transformational and Regional Integration (ESTRIP) Project

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Instruction sheet

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

- Planning, delivering and evaluating community awareness activities on veterinary public health issues
- Conducting veterinary public health awareness activities using effective delivery techniques.
- Operating and using equipment and materials assist the community in understanding the activities.
- 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:

- Plan, deliver and evaluate community awareness activities on veterinary public health issues
- Conduct veterinary public health awareness activities using effective delivery techniques.
- Operate and use equipment and materials assist the community in understanding the activities.
- Address current public health issues

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the "Information Sheets". Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
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6. If your performance is satisfactory proceed to the next learning guide,
7. If your performance is unsatisfactory, see your trainer for further instructions.

Information Sheet 1- Structuring, finalizing and accepting VPH issues plans.

1.1 Introduction

Human health is inextricably linked to animal health and production. This link between human and animal populations, and with the surrounding environment, is particularly close in developing regions where animals provide transportation, draught power, fuel and clothing as well as proteins (meat, eggs and milk). In both developing and industrialized countries, however, this can lead to a serious risk to Public Health with severe economic consequences. A number of communicable diseases (zoonoses) are transmitted from animals to humans. Any disease or infection that is naturally transmissible from vertebrate animals to humans and vice-versa is classified as zoonoses. Veterinary medicine has a long and distinguished history of contributing to the maintenance and promotion of Public Health.

The animal itself, animal health and veterinary science are related to the physical, mental and social well-being of humans and the contribution of Veterinary Public Health (VPH) in this field is considered fundamental. Veterinary Public Health is a fundamental part of Public Health whereby human health and well-being are the main objectives. Veterinary Public Health comprises the application, efforts and knowledge of Veterinary science which contribute to secure, promote and restore human 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. It comprises all the community efforts influencing and influenced by the Veterinary medical arts and sciences applied to the prevention of diseases, protection of life, and promotion of the well-being and efficiency of man. According to the WHO definition of health the following definition of Veterinary Public Health was suggested at a WHO meeting as "Veterinary

Public Health is the contribution to the complete physical, mental, and social well-being of humans through an understanding and application of veterinary medical science.

1.2 Veterinary public health issues

The Role of Veterinary Public Health

- Prevention and control of Zoonotic diseases
- Food protection
- 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

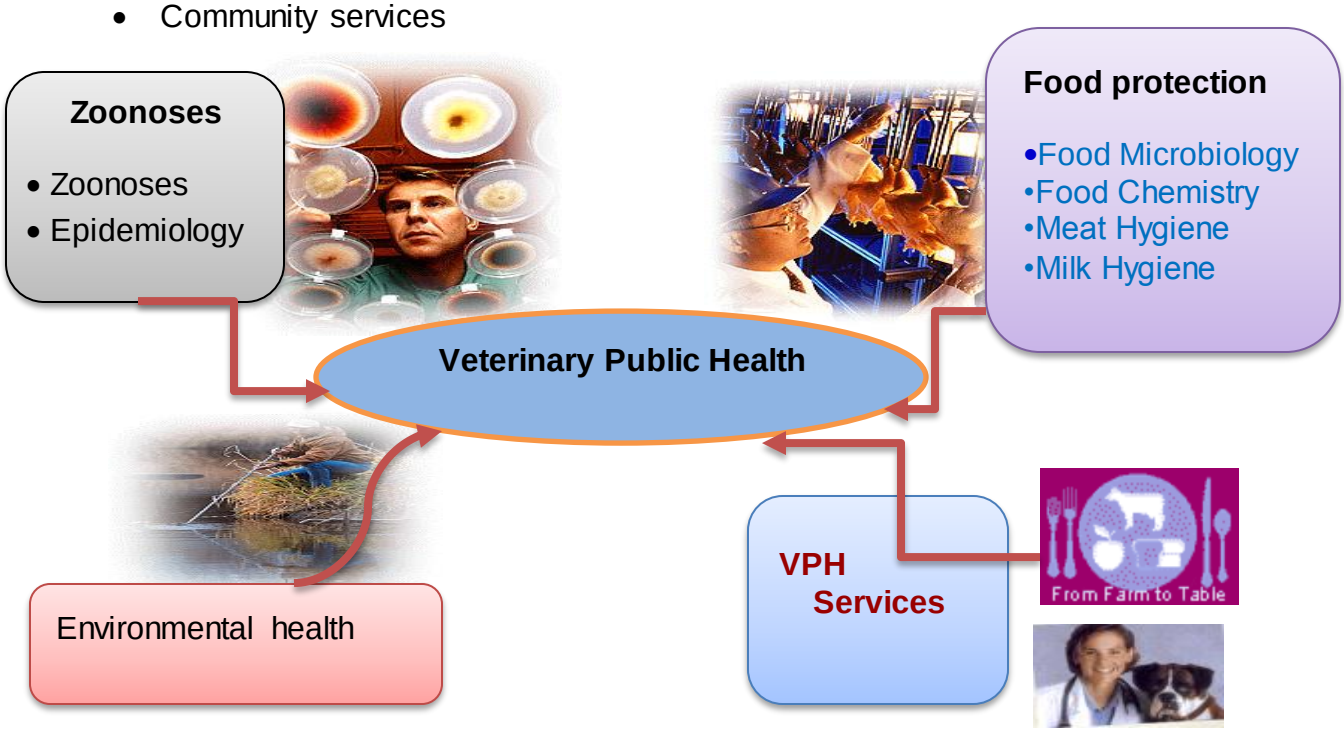

Figure 1. The structure and role of veterinary public health

1.3 Deliver community awareness activities on veterinary public health issues

The implications of structural adjustment programme of veterinary services

During the past decade consumers have become increasingly aware of food safety issues, and this has resulted in a new focus on government guarantees to consumers and trade partners in agricultural products. However, the reaction by governments in response to these demands has varied considerably. The changing environment appears to have polarized VPH involvement into either meeting or compromising on national or international demands. Most of the structural changes give practical meaning to the "farm-to-table" approach, and recognize the multidisciplinary nature of VPH service delivery at a national level.

Each year millions of people are affected by foodborne and waterborne diseases and thousands die, especially children in developing countries. Improper methods of food production, storage, handling and preparation have resulted in many recognized international outbreaks. Food animals are the reservoir for many emerging and important foodborne diseases, including those caused by Escherichia coli O157:H7, non-typhoidal Salmonella spp., Campylobacter spp. and Yersinia spp. VPH leadership is essential to respond to the threat posed by these diseases, particularly in the development of sustainable, integrated safety measures for the reduction of health risks along the entire food chain, from the point of primary production to the consumer (i.e. the "farm-to-table" approach).

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 of the 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.

Other principles needed to maximize the effectiveness of any education/training/ community awareness should include:

- Protect consumers against zoonotic diseases
- Avoid unaesthetic products
- Ensure hygienic processing, storing and marketing of meat
- Avoid harmful products like antibiotics and pesticide residues
- Help to identify and control infectious diseases especially notifiable diseases
- Protect the economy of the country
- Avoid cruelty against animals by ensuring humane animal handling and slaughter
- practices
- Ensure sanitary conditions in slaughterhouses
- Ensure hygienic disposal of waste products.

The services of lay workers could be better utilized for providing village level basic human and animal care. This could be done through their education and training in vaccination, presumptive diagnosis and subsequent reporting to veterinary or medical officers. Data collection could also be achieved and above all, educating animal owners about the importance of VPH, the risks involved and what steps can be taken to avoid them. Education of animal owners and animal product producers is of critical importance, because without a change in their attitude and practices, nothing substantial can be attained.

- community based VPH program, especially those involving grass roots approaches
- VPH program developed specifically to identify zoonotic infections and risks for children (9-16 years of age) working as apprentices in abattoirs. Abattoir waste water quality assessment was also included as a measure of environmental pollution.

Food hygiene and disease prevention are fundamentally important. All personnel should be aware of their role and responsibility in protecting food from contamination or deterioration. Community and food handlers should have the necessary knowledge and skills to enable them to handle food hygienically.

Community awareness activity delivery techniques

- Develop and disseminate strategic visual and audio materials through Radio and Television Channels and other means
- Community awareness, participation, mobilization and Health and Hygiene Education campaign
- Behavior change training of trainer workshops
- Local/ community based campaign and awareness program
- Yearly reward and recognition events (with letter of appreciation, token for contribution, and honorary certificate)
- Developing different types of brochures and disseminate
- Through magazines/Journals

Self-Check 1 – Written Test

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

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

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

1. A number of communicable diseases (zoonoses) are transmitted from animals to humans.
2. Veterinary Public Health is not fundamental part of Public Health whereby human health and well-being are the main objectives.
3. Community and food handlers should have the necessary knowledge and skills to facilitate handling of food hygienically.

Test II. Choose the best answer for the following questions (3 point).

1. Which one is not the principles needed to maximize the effectiveness of any education/training/ community awareness?
   A. Avoid unaesthetic products
   B. Ensure hygienic processing, storing and marketing of meat
   C. Ensure sanitary conditions in slaughterhouses
   D. Protect consumers against zoonotic diseases
   E. None of the above

Test III. Short Answer Questions (5 point)

1. What are the Role of Veterinary Public Health?

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

You can ask your teacher for the copy of correct answers

Information Sheet 2- Conducting veterinary public health awareness activities

2.1 Creation of awareness on zoonotic diseases

Public Health (VPH) is a component of public health that is devoted to the application of professional veterinary knowledge, skills and resources to the protection and improvement of human health. VPH contributes to the physical and social wellbeing of humans through an understanding and application of veterinary science. Many human diseases are transmitted through foods of animal origin especially meat, milk, eggs and fish, while others are transmitted through contact with infected animals or materials from infected animals.

A zoonosis (plural zoonoses, or zoonotic diseases) is an infectious disease that has jumped from a non-human animal to humans. Zoonotic pathogens may be bacterial, viral or parasitic, or may involve unconventional agents and can spread to humans through direct contact or through food, water or the environment. They represent a major public health problem around the world due to our close relationship with animals in agricultural animals.

VPH is therefore devoted to the following specific aims:

1) Provision of hygienically safe and nutritionally adequate animal derived food for human consumption.
2) Prevention of zoonotic diseases and other occupational hazards to animal owners
3) Prevention of environmental contamination from agricultural and veterinary related activities.

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

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

- Inspection of animals offered for slaughter to ensure that they are free from infectious and zoonotic diseases
- Inspection and quality assurance of meat to ensure its suitability for human consumption
- Inspection and quality assurance of fish to ensure its suitability for human consumption
- 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

2.2 Source of infection and mode of transmission of diseases

Sources of microbial food contamination

- Environmental sources: contaminated soil and water where food is produced.
- Animal sources: sick animals or animals carrying disease causing microorganisms (reservoirs), or animal products,
- Products of animal origin contaminated with microorganisms
- Fish contaminated with pathogens
- Plant sources - vegetables contaminated with pathogens
- Human sources - Food handlers carrying pathogenic microorganisms
- Contaminated raw materials used in the manufacture of food products
- Food processing and handling equipments and utensils
- Contaminated transport and storage facilities;
- Pests in the food environment.

Mode of transmission of diseases

In the community occur from an infected or contaminated source and spread in the community through contact, consumption of contaminated food and water, inhalation, or through insect vectors such as mosquitoes, tsetse flies and sandflies. Others diseases are spread through contact with infected animals and /or their products.

2.3 Prevention and control means to the public

Disease is any impairment of the normal physiological function of plant and animal caused by inorganic or pathogenic agents. Disease is caused by (i). Non-living agents which can be physical or chemical agents. (ii). Living agents (microorganisms) such as bacteria, viruses, fungi, protozoa, helminths, rickettsial, chlamydia etc. Environmental factors such as adverse climate/weather, overcrowding, poor sanitation, poor air quality and poor nutrition can sometimes help living agents to cause disease in their host by weakening host resistance to infection.

Prevention and control of diseases can be achieved through the following approaches:

1 Food protection and control

Food may get contaminated with physical, chemical and biological hazards during production, harvesting, processing, distribution/transportation and storage. Food protection and control aims at ensuring that food is not contaminated with the various hazards found in the environment. It involves safeguarding food sources (e.g fishing environments), protecting food from contamination with various food hazard (e.g by control of animal diseases, protective packaging of food, hygienic transportation and storage), and elimination of biological hazards already in the food through various means (e.g. heating, processing).

2 Environmental protection

Environment refers to the physical components of environment which include air, land and water from which living organisms derive their livelihoods. Environment can also refer to the combination of external physical conditions that affect and influence the growth, development and survival of living organisms, or external conditions or surroundings especially in which people live (living environment-housing and other basic facilities and needs), or work (work environment -the conditions in which an individual or staff works including amenities). Living environments focus primarily on living arrangements (and how they impact on health and wellbeing of people. Environmental pollution can affect the survival and well-being of human beings or living

organisms. Pollution is any addition of chemical or form of energy to air, water, soil or food that threatens the health, survival or activities of human or living organisms. The environment can be polluted by an array of contaminants including, hazardous (poisonous, toxic, irritant, or corrosive) gases and particulates, poisonous chemicals (heavy metals, pesticides, herbicides etc), disease causing microorganisms and radiation. The presence of these substances in the environment constitute a health hazard to human beings. Prevention of environmental pollution with these substances constitute environmental protection.

3 Environmental sanitation and hygiene

Environmental sanitation and hygiene is the process of taming the environment so that it no longer constitute a health hazard to man. Environmental sanitation and hygiene is important in the prevention of a number of important diseases in the community especially diseases that are transmitted by fecal-oral route like intestinal worms, food and water borne pathogens e.g. those causing cholera and typhoid fever. Prevention of such diseases consists of measures aimed at proper disposal of wastes and control of environmental hygiene, such as the use of latrines/ toilets that are properly constructed and maintained, provision of potable water, adequate preparation and cooking of food and personal hygiene. In addition, proper disposal of refuse help to keep the number of flies and cockroaches low as they play role in transmission of these diseases.

4 Environmental management

This is part of an integrated approach in the control of diseases. Environmental management covers the following components:

1 Control of insect vectors and pests. Manipulation of environment to produce temporary conditions that are unfavorable to vector or pathogen breeding, e.g. draining of stagnant water, bush clearing around homes for control of mosquitoes. The permanent or long-term modification of land, water and vegetation e.g clearing of vegetation, and or conversion of forest to cropland will reduce occurrence of tsetse flies that transmit sleeping sickness

2 Provision of proper housing. The modification or manipulation of human habitation such as proper construction of houses with adequate space, ventilation, lighting, sanitary facilities and easy to clean to avoid accumulation of dirt are key to the control of diseases.

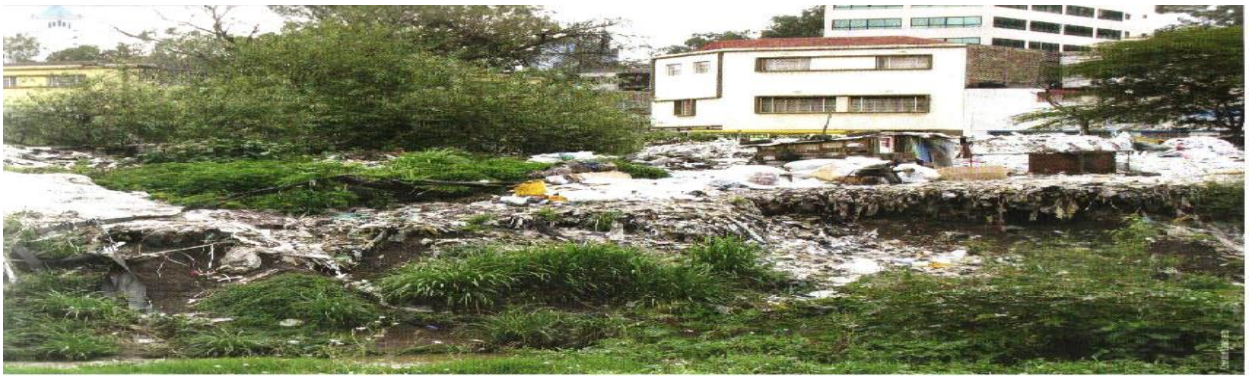

Figure 2. Uncollected garbage cause poor environmental quality

2.4 Awareness on hygienic management of meat

The aim of meat hygiene and inspection is to ensure the fitness and safety of meat for human consumption. The meat and meat products should not carry pathogenic microorganisms that might cause disease in man, nor shall they contain microbial toxins or chemical residues that might affect public health. Adequate meat hygiene measures covers the time period animals are on the farms before they are transported to the abattoirs, through its journey to and from the abattoir until the consumption of the final meat products. It involves hygienic production of food animals, ante mortem inspection of slaughter animals, handling and slaughter of animals, post-mortem inspection of carcass, design and hygiene of slaughterhouses and meat industries, design and hygiene of meat carriers, hygiene of slaughterhouse and meat industry personnel and equipment, management of waste from slaughterhouses and meat industries.

Slaughterhouse staff (food handlers) should be made fully aware of and conversant with the need for occupational hygiene, not only to avoid infection and food contamination but also from becoming carriers of infection to their families and communities. Education on good standards of health and hygiene and its importance are essential. Staff should be educated on:

- Hygienic slaughter e.g using only properly washed and sterilized equipments e.g knives, pangas, axes, saws.
- Maintaining cleanliness of the personnel, operation area and the environment.
- Operations and equipments in use in the slaughterhouse
- How and why unsanitary practices should be avoided.
- Thorough washing of hands with soap after visiting toilet, smoking, coughing or sneezing, handling of money, garbage or soiled or infected material.
- Knowledge that negligence may be detrimental to the whole community.

Personnel should be avoid the following unsanitary practices (or bad habits)

- Walking aimlessly while operations are going on
- Unguarded coughing and sneezing can spread pathogenic and respiratory bacteria:
- Spitting on hands to enable firm gripping of an axe, panga e.g. while splitting carcass
- Licking of fingers to pick up items e.g. papers, utensils, paper towels or wrapping papers or to turn over the pages of a book
- Biting of finger nails or or cutting by using slaughter or meat inspection knife
- Placing the pen, fingers in the mouth
- Shaking of hands in the slaughterhouse
- Smoking of cigarettes, hang or sniffing of tobacco
- Unnecessary touching of meat
- Chewing sweet-gum
- Blowing or wiping of nose using bare hands or protective clothing
- Scratching of head, use of mobile telephones
- Eating, brushing of teeth, chewing miraa, Urinating near food
- Taking beer/drunk ardness during operations
- Changing of clothes near food/meat
- Confrontations, fighting, playing in the slaughterhouse
- Stealing of meat

Self-Check 2 – Written Test

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

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

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

1. Zoonoses, are an infectious disease that has jumped from a non-human animal to humans.
2. Food may get contaminated with physical, chemical and biological hazards only during production.
3. Disease is any impairment of the normal physiological function of plant and animal caused by inorganic or pathogenic agents.

Test II. Choose the best answer for the following questions (4 point).

1. Which one of the following is the sources of microbial food contamination?
   A. Products of animal origin contaminated with microorganisms
   B. Fish contaminated with pathogens
   C. Plant sources - vegetables contaminated with pathogens
   D. Contaminated raw materials used in the manufacture of food products
   E. All of the above

Test III. Short Answer Questions (5 point)

1. Describe the aim of veterinery public health?
2. Describe the unsanitary practices should be avoided in the slaughter house.

Note: Satisfactory rating – 10 points **Unsatisfactory - below 10 points**

You can ask your teacher for the copy of correct answers

Information Sheet 3- Operating and using equipment and materials assist the community in understanding the VPH activities

3.1. Introduction

Raising awareness about various aspect of public health problems related to food of animal origin at the community level is key for successful implementation of VPH program. Public awareness includes: creating awareness on the risks associated with bad eating habits; risks of drug residues in food and importance of meat inspection. A Community Awareness and Participation Plan (CAPP) has been prepared to ensure widespread, ongoing, and meaningful participation of the key stakeholders with a focus on the poor and the vulnerable groups. The “reach” and “sustainability” of development initiatives are improved when all stakeholders, including the poor and the vulnerable groups, have an opportunity to participate in shaping investment programs and the voice of the poor is heard at all levels of decision- making. Stakeholder analysis was undertaken to ensure that relevant stakeholders are identified and included in the participatory project design process.

Social media has been an enabler of information dissemination, collaboration and coordination for reasons ranging from personal to political. In healthcare information dissemination is a key mechanism of creating awareness, a crucial factor in the early detection and prevention of diseases. The social computing phenomenon (e.g. the proliferation of social media tools such as

- Facebook,
- YouTube,
- Myspace,
- Instagram
- Twitter) is creating a new reality in health care, bringing social media to the forefront of health information generation and dissemination.

Patients are changing from consumers of Internet content to generators of information using social media sites and Web 2.0 tools. The term health 2.0 or medicine 2.0 is thus now commonly used. Social media provides a forum for reporting personal experiences, asking questions, and receiving direct feedback for people living with a disease. Through social media, support groups have found a new platform for organizing as patients and family caregivers share their experiences, seek consultation online, and connect with others.

3.2 The role of social media

- Social media use for health awareness
- Collaborating through social media
- sing social media for grassroots community building
- Informing and educating
- Sharing testimonies
- Advocating
- Raising funds

Traditional information technology tools: Evidence

- Website
- e-newsletter
- e-mail alert

Social media tools:

- Facebook
- Twitter
- YouTube
- Blog
- LinkedIn

Mainstream media tools

- Radio
- Television
- News paper

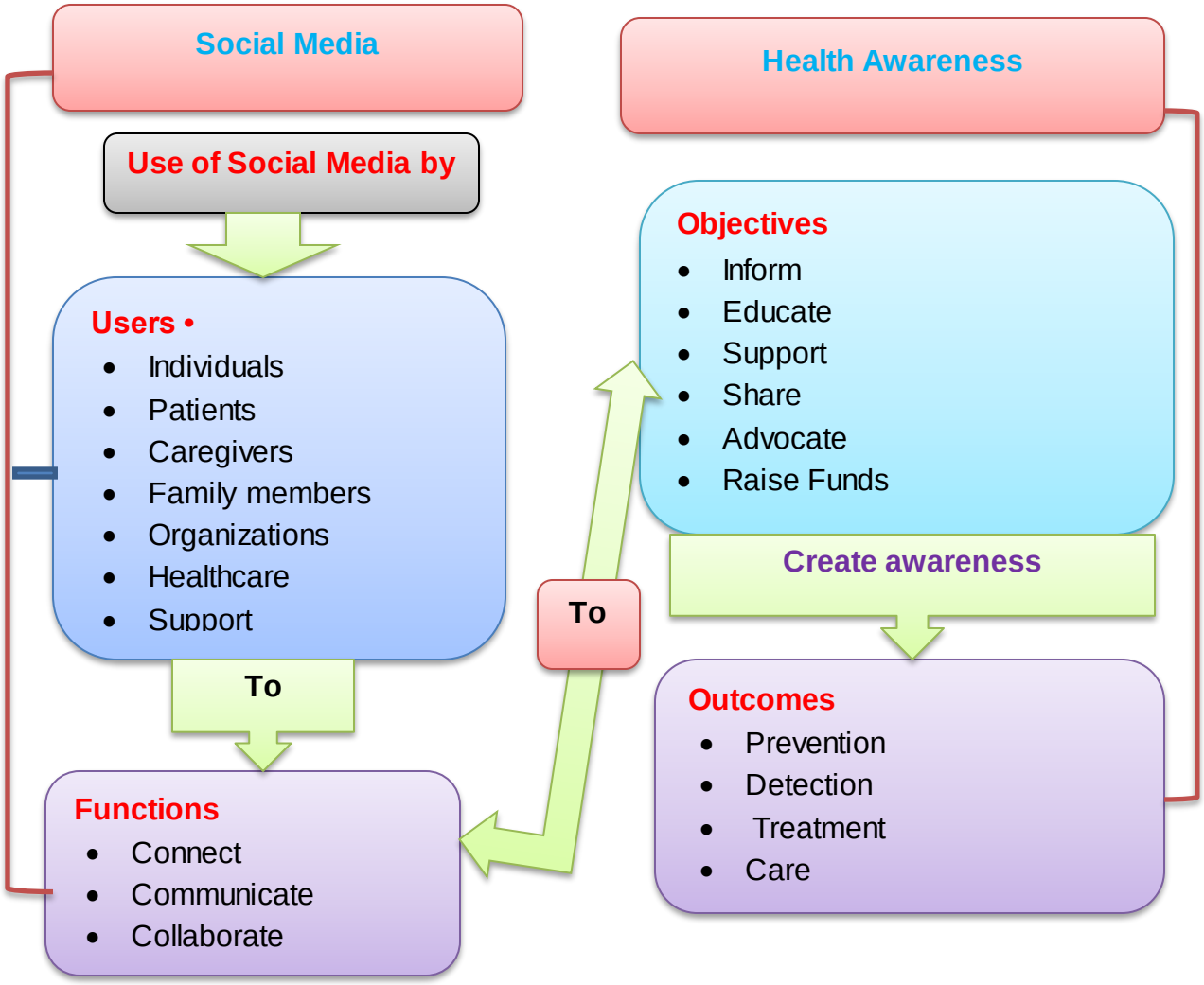

Figure 3. The users and functions of social media to create health awareness

Self-Check 3 – Written Test

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

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

Test I. Write true if the statement is correct/False if it is incorrect for the following questions (4 point each).

1. Healthcare information dissemination is a key mechanism of creating awareness, a crucial factor in the early detection and prevention of diseases.
2. A Community awareness and participation plan has been prepared to ensure widespread, ongoing, and meaningful participation of the key stakeholders with a focus on the poor and the vulnerable groups.

Test II. Short Answer Questions (5 point each)

1. What are the role of social media in addressing health issues?
2. Describe and discuss the tools used to create community awareness regarding public health issues.

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

You can ask your teacher for the copy of correct answers

Information Sheet 4- Addressing current public health issues

4.1 Introduction

There is an urgent strategic need for health promotion to engage with the international discourse on 'sustainability'. To date much of the discussion and policy development addressing 'sustainable development' has treated the economy, livelihoods, energy supplies, urban infrastructure, food-producing ecosystems, wild-ernes conservation and convivial communal living as if they were ends in themselves. The ultimate goal of sustainability is to ensure human well-being, health and survival. If our way of living, of managing the natural environment and of organizing economic and social relations between people, groups and cultures does not maintain the flows of food and materials, freshwater supplies, environmental stability and other prerequisites for health, then that is a non-sustainable state. The second fundamental threat to the improvement and maintenance of population health is the recent advent of unprecedented global environmental changes.

4.2 Electronic and print medias role

It is well recognized that the media plays an enormously influential role in public responses to health issues. The mass media - print, television, radio and internet - has an unparalleled reach as a communication mechanism. It has substantial power in setting agendas, that is, what we should be concerned about and take action on, and framing issues, that is, how we should think about them. Public health professionals have always been sensitive to the persuasive power of the mass media. In fact public health has often had the challenging task of both using the media to influence health practices while countering this same influence where it encourages unhealthy choices. These issues are especially acute in a crisis, such as the current A (H1N1) 'swine' influenza pandemic. On such occasions hitting the right pitch is crucial, and difficult. Health communicators may need to advocate rapidly and effectively for the public adoption of basic preventive measures, like handwashing, while such messages may be

displaced in a mass media dominated by discussion of technical interventions, such as thermal scanners.

Current global public health issues

- Emerging and re-emerging infectious diseases
- Unprecedented global environmental changes.
- Declining regional life expectancy
- Global pandemic diseases

In addition to electronic and print media current public health issues shall be addressed through the following methods

- Advancing interdisciplinary and implementation research in health with the involvement of federal, provincial and local government for contextually tailored evidence to inform policy.
- Continuing to promote health research networking and alliance among academia, healthcare institutions, scholars and researchers, with different stakeholders in national and international level.
- Facilitating to enhance knowledge and skills to conduct health research by young researchers and scientists by increasing capacity, building opportunities, and availability of research grants especially for the provinces.
- Strengthening the mechanism to promote maximum use of digital technologies in research process including dissemination.
- Strengthening translation of locally generated evidence into policies and practices through closer collaboration with policymakers.
- Promoting responsible conduct of health research in academic and non-academic institutions.
- • Promoting health research in **COVID-19 pandemic** as per national guideline for strengthening evidence generation on COVID-19.

Self-Check 4 – Written Test

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

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

Test I. Write true if the statement is correct/False if it is incorrect for the following questions (4 point each).

1. The mass media - print, television, radio and internet - has an unparalleled reach as a communication mechanism in addressing current public health issues.
2. Threat to the improvement and maintenance of population health is the recent advent of unprecedented global environmental changes.

Test II. Choose the best answer for the following questions (4 point).

1. Current public health issues shall be addressed through the following methods:

A. Advancing interdisciplinary and implementation research
B. Continuing to promote health research networking and alliance
C. Strengthening the mechanism to promote maximum use of digital technologies
D. All of the above

Test III. Short Answer Questions (4 point)

1. List down current global public health issues.

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

You can ask your teacher for the copy of correct answers

LG 61	LO 2. Prepare to Conduct the Ante Mortem and Post-Mortem Examination

Instruction sheet

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

- Obtaining and preparing correct clothing, equipment and resources for use
- Identifying and taking action to protect OHS hazards to self and others
- Obtaining and collating relevant preliminary information about the animal to be examined
- Keeping work area clean and hygienic
- Performing ante mortem examination of animal
- Carrying out external assessment of the animal and outward signs of abnormalities
- Identifying and taking action on abnormal characteristics of animals prior to slaughter
- Passing judgment for slaughter based on ante mortem examination
- Moving the animal to slaughtering room
- Carrying out humane methods of slaughtering

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:

- Obtain and prepare correct clothing, equipment and resources for use
- Identify and take action to protect OHS hazards to self and others
- Obtain and collect relevant preliminary information about the animal to be examined
- Keep work area clean and hygienic
- Perform ante mortem examination of animal
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- Identify and taking action on abnormal characteristics of animals prior to slaughter
- Pass judgment for slaughter based on ante mortem examination
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6. If you earned a satisfactory evaluation proceed to “Operation sheets
7. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
8. If your performance is satisfactory proceed to the next learning guide,
9. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

Information Sheet 1- Obtaining and preparing correct clothing, equipment and resources for use

1.1 Working cloth hygiene

In agro-food industries, clothing can be a major vector involved in food contamination. Work clothing, when not clean, can be a source of contamination for hands, whenever it is used to wipe them. In certain sectors, such as butchery, clothing is in direct contact with handled carcasses, (e.g. in shouldering carcasses when loading delivery vehicles).

Work clothing management must respect some specific principles:

- It is of a standard type and is provided by the company.
- It is put in a locker (or a compartment of cupboard), physically separated from personal clothing (the locker shall be maintained in a clean manner).
- Its colour, or the colour 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 – this includes snoods for moustaches and beards (head covering may also be devoted to other purposes, such as shock proof helmets).
- It includes shoes (crush proof and non-skid) which are only worn in the factory (foot wear shall not contaminate work wear in a locker).
- It is laundered by the company or under its responsibility (e.g. by contract with an industrial laundry – in this case the wash method shall be defined to ensure that laundry is not cross contaminated from dirty clothing from other sources).
- It is;
  - ✓ Hard-wearing to mechanical actions (tear) and frequent washing,
  - ✓ Ignition proof.
- Permanent devices (boots/shoes washstands) or movable ones (trays), containing a disinfecting solution, must allow cleaning/disinfection of shoes or boots before getting into the production zone.

Figure 4. Slaughterhouse workers dressed in their protective clothing.

The cleanliness of personnel and the external environment of the slaughterhouse is satisfactory.

1.2 Equipment hygiene

- Equipment shall be:
  - ✓ Smooth not subject to rot
  - ✓ Stainless
  - ✓ Washable (without nooks and crannies that are inaccessible for cleaning)

Compliance with these rules prohibits the use of undressed wood, cardboard or tape for the manufacture of furniture (or their use in temporary repairs). Equipment should not be placed adjacent to walls so as to allow for proper cleaning and for proper pest and cleaning inspection.

- Materials used to manufacture tables shall be:
  - ✓ Smooth not subject to rot
  - ✓ Light coloured hard-wearing
  - ✓ Washable impermeable

The compliance with these rules prohibits the use of undressed wood or cardboard, and porous or rough materials like undressed concrete. The materials most often used are stainless steel, plastics and glazed earthenware tiles.

- Tools shall be:
  - ✓ Inalterable in all parts.

The compliance with this principle prohibits the use of wood even for the handles of tools. The materials most often used are stainless steel, aluminium (which may not be allowed by some food control authorities, in the US for example) and plastics.

- Machines shall be:
  - ✓ Not subject to deterioration, preferably stainless, definitely non-corrosive.
  - ✓ Easily dismantled.
  - ✓ Washable (without nooks and crannies that are inaccessible for cleaning).

Basic equipment required

- Protective clothing is required for protection from contamination with blood, tissues and body fluids from the body of the dead animal that are potential carriers of infectious particles.
- Wearing of a gown, rubber boots, gloves, and butcher's plastic vest is recommended.
- Wash protective clothing clean and disinfect after every use.
- The choice of equipment for postmortem examination depends on the size of the animal and the individual preferences of the examiner (Figure 5). 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

A. Basic postmortem equipment

B. Sampling facilities

Figure 5. Basic postmortem equipment

Self-Check 1 – Written Test

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

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

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

1. In agro-food industries, clothing can be a major vector involved in food contamination.
2. Materials used to manufacture tables shall be smooth not subject to rot which affect the quality of food.
3. The choice of equipment for postmortem examination depends on the size of the animal.

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

1. Equipment shall be for postmortem examination shall be:
   A. Smooth not subject to rot
   B. Stainless
   C. Washable impermeable
   D. All of the above

Test III. Short Answer Questions (2 point)

1. Describe equipment used for postmortem examination?

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

You can ask your teacher for the copy of correct answers

Information Sheet 2- Identifying and taking action to protect OHS hazards to self and others

2.1 Introduction

Workplaces can be dangerous; there are many hazards that have the potential to kill, injure or cause ill health or disease. Protecting the health and safety of people in the workplace is a community expectation that makes good business sense. Workplace incidents can have a dramatic impact on people's lives (people in the workplace, families and friends), and they can have significant financial impacts on organizations through loss of skilled staff and lost production of goods or services.

A safe and healthy workplace and compliance with the law does not happen by chance or guesswork. Good health and safety is all about eliminating and controlling hazards and risks. This is best achieved by a proper consideration of the sources of harm and what can be done to prevent the harm from occurring.

2.2 Consultation with HSRs and employees is critical

Consultation with Health and Safety Representatives (HSRs), employees and others is a critical part of controlling OHS hazards and risks. Apart from it being required by law, involving HSRs, employees and others at the workplace in the method makes sense. The people who do the job often know and can provide insight into how hazards and risks can come about, and about the workability and effectiveness of potential controls. They also have to work with the control measures, and they will do this more effectively if they understand the reasons for them and how they work. Consultation with HSRs, employees and independent contractors and their employees at the workplace in each step of the process is required by law; that is, when:

1. Identifying and assessing hazards and risks.
2. Making decisions about controlling risks.
3. Making decisions about procedures for providing information and training to employees and monitoring the health of employees.

Consultation must involve sharing information with those people, giving them a reasonable opportunity to express their views, and taking those views into account. If there is a Health and Safety Committee, it may be useful to engage the committee in the process as well.

There are four important concepts that need to be understood so that this guide makes sense:

- **A hazard** is something currently in, or may in future be in, the work environment that has the potential to cause harm to people.
- **A risk** is the chance (or likelihood) that a hazard will cause harm to people.
- **Harm** is death, injury, illness (including psychological illness) or disease that may be suffered by a person from a hazard or risk.
- **A control** is a thing, work process or system of work that eliminates an OHS hazard or risk or, if this is not reasonably practicable, reduces the risk so far as reasonably practicable.

Risk analysis comprises risk assessment, risk management and risk communication; these terms are briefly defined below.

Risk assessment typically comprises hazard identification, exposure assessment, and dose response assessment and risk characterization.

Risk management seeks to identify various options for mitigating risk and for selecting the optimal course of action, after considering the benefits and costs, in consultation with interested parties in industry, the government and academia, as well as the general public.

Risk communication is the process of consultation, discussion and review that seeks to enhance the validity, effectiveness and general acceptance of risk assessment and risk management.

Steps in controlling OHS hazards and risks

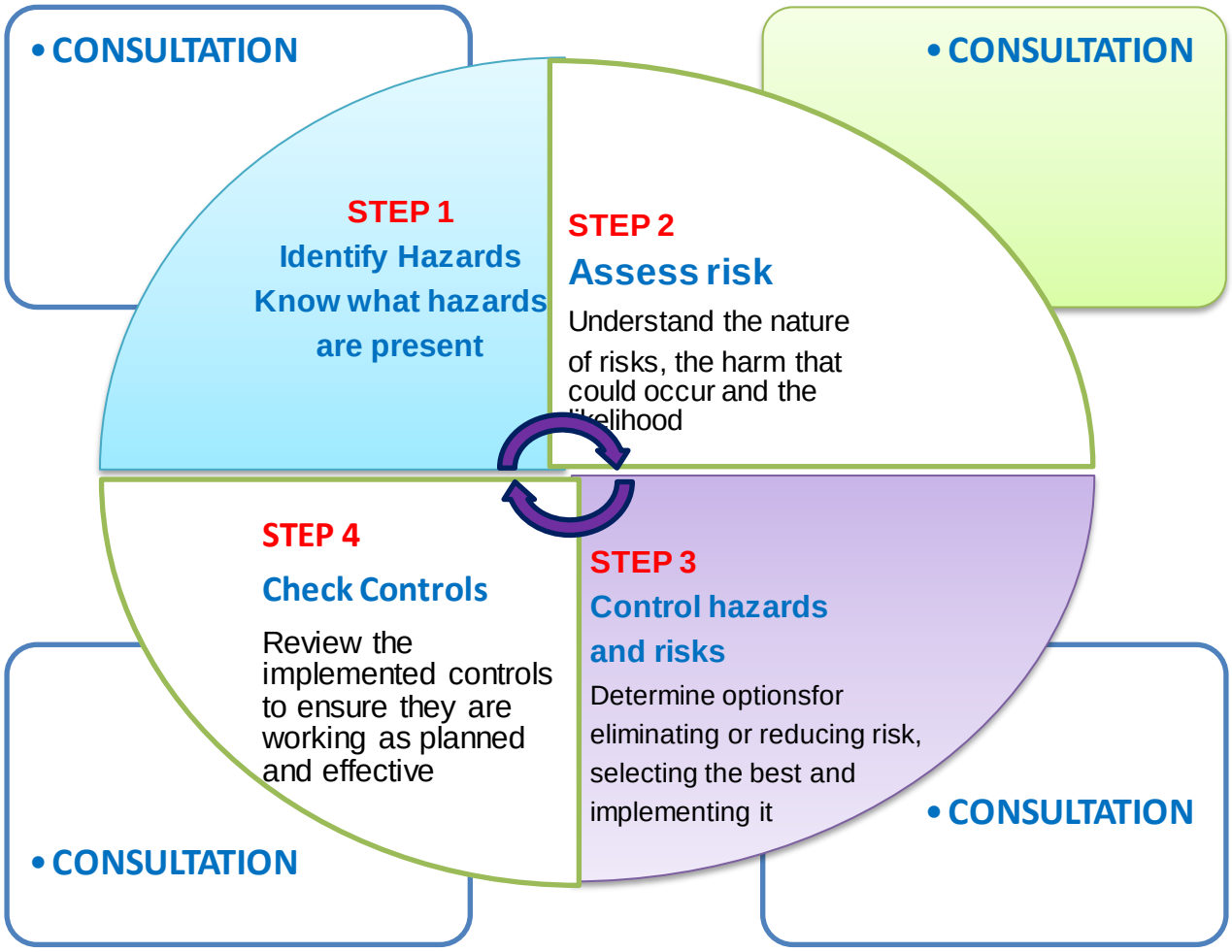

Figure 6. Steps in controlling OHS hazards and risks

Table 1: Common workplace hazards

Mechanical or physical hazard hazards	Plant, equipment and items (and parts of them) that have the potential to cut, rip, tear, abrade, crush, penetrate, produce projectiles or cause sudden impact. A range of sources of energy that have the potential to cause harm, including electricity, heat, cold, noise, high powered light and damaging radioactive sources. Animal bites, kicks or scratches, flooding, electrocution…
Chemical and biological hazards	Chemicals, compounds, materials, powders, dusts and vapours that have the potential to impair health, have adverse effects on human reproduction, cause disease or have explosive, flammable, toxic or corrosive properties. Drug residues Biological agents and wastes (Bacteria, Virus, Parasites…) Zoonosis, Release of infective agents
Psychological hazards	Events, systems of work or other circumstances that have the potential to lead to psychological and associated illness, including work-related stress, bullying, workplace violence and work-related fatigue. Activities that cause stress to the muscles and/or skeleton, including manual handling of people, animals, goods or materials and things or circumstances that can cause a person to slip, trip or fall at the same level.

Self-Check 2 – Written Test

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

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

Test I. Write true if the statement is correct/False if it is incorrect for the following questions (4 point each).

1. A safe and healthy workplace and compliance with the law does happen by chance or guesswork
2. Harm is the chance (or likelihood) that a hazard will cause harm to people.
3. Consultation with Health and Safety Representatives (HSRs), employees and others is a critical part of controlling OHS hazards and risks.
4. Control is a thing, work process or system of work that eliminates an OHS hazard or risk.

Test II. Choose the best answer for the following questions (4 point).

1. Which one of the following is not physical hazard?
   A. Animal bites
   B. Scrach
   C. Electrocusion
   D. Chemical burning

Test III. Short Answer Questions (10 point)

1. Describe and briefly discuss workplace hazards.

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

You can ask your teacher for the copy of correct answers

Information Sheet 3- Obtaining and collating relevant preliminary information about the animal to be examined

3.1. Introduction

Traceability is tracking the movement of identifiable products through the marketing chain. Traceability can be used to convey information about a product, such as what it contains, how it was produced and every place it has been. It is the marking of individual animals or group of animals so that they can be tracked from place of birth/origin to slaughter. Producers keep records on identities of each animal. A well designed traceability system provides accurate data on the origin, sex, age, breed, movements, and records of treatments that an animal received.

Animal health information recording refers to the process by which indicators of the health status of animal populations and related data on prevention, surveillance and outbreak management are systematically collected, recorded, calculated and securely stored and made accessible to users as appropriate.

a. Functions of animal identification and traceability

Commercial production and marketing: Traceability can help to identify and exploit desirable production characteristics e.g better yields, fast growth etc. Traceability helps to coordinate shipments, manage inventories and monitor customer behaviour. Some customers prefer milk, meat or eggs from animals raised according to specified organic, humane treatment or environmental standards. Traceability can help firms separate and keep records on these unique products to verify production methods. Improved traceability is viewed as important for maintaining foreign market access as animal identification systems are being used as technical barriers to trade. Functioning traceability systems are often a pre-condition for meat producing countries to enter export markets. Universal bar codes on processed food and meat products are widely used for tracking.

Animal health: Traceability systems are important tools to prevent the spread of animal diseases and to enhance biosecurity in general. Animal identification can help track

down more quickly the source of diseases in flock/herds in order to determine origin of the animals, cause of the disease, control and prevent their spread. When used in animal health programs, animal identification and tracing systems are likely to have both commercial and regulatory functions.

Food safety: In slaughterhouses, meat traceability requires the clear identification of the live animals through to meat products. A rigorous animal identification and trace back can prevent potentially serious food safety problems. Traceability system can facilitate recalls of meat products, enhance process controls, testing and other science based food safety measures. In addition, it will possibly facilitate identification of the source of the disease, timely application of control measures to contain its spread, as well as help authorities prevent future disease incidents. Improved traceability may enable firms to limit their legal and financial liabilities.

b. **Relevant preliminary information about the animal to be examined**

The following are the basic information should be relevant:

- Origin of the animal
- History of the animal
- Health record if available
- Sex
- Breed of animal
- Species
- Previous history of treatment and vaccination

Self-Check 3 – Written Test

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

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

Test I. Write true if the statement is correct/False if it is incorrect for the following questions (4 point each).

1. Traceability is tracking the movement of identifiable products through the marketing chain.
2. Animal identification can help track down more quickly the source of diseases in flock/herds in order to determine origin cause of the disease.
3. In slaughterhouses, meat traceability requires the clear identification of the live animals through to meat products.

Test II. Choose the best answer for the following questions (6 point).

1. _____can help firms separate and keep records on unique products to verify production methods.
   A. Animal health
   B. Traceability
   C. Food safety
   D. All of the above

Test III. Short Answer Questions (10 point)

1. Write all the preliminary information of animal to be eamined at ante mortem inspection.

Note: Satisfactory rating - 14 points **Unsatisfactory - below 14 points**

You can ask your teacher for the copy of correct answers

Information Sheet 4- Keeping work area clean and hygienic

4.1 Definition of terms

The concepts of sanitation, hygiene, cleaning and disinfection are very broad and to a considerable extent overlap with each other, so for the purpose of this chapter we will assume that:

- **Sanitation** refers to all the processes and principles which are applied to ensure that the microorganism count is kept at a safe low level in accordance with (official health) regulations.
- **Hygienic** refers to a condition that includes the concepts of “clean” and “safe” (in other words the absence of harmful organisms or substances).
- **Cleaning** refers to the ongoing process of cleaning which takes place throughout the day and reaches its peak after the slaughtering process has ended. This process includes the mechanical and chemical methods by which macroscopic, visible dirt is removed. When an object appears to be clean, it is not necessarily free of harmful micro-organisms.
- **Disinfection** refers to the process of removing by which micro-organisms and their spores are killed or inactivated so that they cannot spread to other objects and contaminate them.

4.2 Make work area clean

The aim of food hygiene is to ensure clean, safe and wholesome food.

It is extremely important for the management of an abattoir to be fully informed of their duties in respect of hygiene, which the Act imposes on them. If they are not, a tendency could arise to favour production above hygiene, or even attempt to economize on cleaning and disinfecting materials.

1) All parts of an abattoir as well as fixed articles, equipment, tables and implements must be kept clean and in good condition to the satisfaction of the meat inspector.
2) All parts of the abattoir, as well as all partitions, equipment and utensils used in the abattoir and which come into contact with the carcass, meat or animal product, must be thoroughly cleaned and disinfected at the end of the working day, or more frequently should it be required.
3) All equipment, implements, tables, containers, disposal chutes and so on must be made of a material that can be easily cleaned and sterilized.
4) All machinery and equipment used in an abattoir must be so designed and situated as to be easily accessible for cleaning.
5) Equipment such as fillers, boilers, autoclaves, digesters and mixer tanks must, when not in use, be kept at a temperature that inhibits the growth of heat resistant micro-organisms.
6) All equipment that has been in contact with bile, faecal or disease-infected material must be cleaned and sterilized immediately before re-use.
7) Metal brushes or steel wool may not be used, because they damage the surface of the equipment; this makes proper cleaning and disinfection difficult.
8) Cloths may not be used for drying, as this only spreads contamination.
9) No polish or other substance that contains any poison may be used for the cleaning or polishing of equipment. All such substances must be SABS approved.
10) After cleaning all utensils and surfaces of equipment, the abattoir must be thoroughly disinfected, including the floors and walls.
11) The disinfection of an abattoir and its equipment, which is infected by a contagious human or animal disease, must be done in a way and with a disinfectant approved by the National Executive Officer.
12) The holding area must also be thoroughly cleaned and when necessary disinfected.

13) A water supply of at least 900 liters per slaughter unit in the case of red meat abattoirs and 15 liters in the case of a chicken abattoir must be available to protect against contamination, and the quality of this water must meet certain requirements.

14) A satisfactory supply of hot water at a minimum temperature of 40 - 50°C must be available at all times during working hours where necessary for cleaning.

15) It is the responsibility of the abattoir owner to ensure that the premises are kept as free as possible from rodents, birds, cats, dogs, flies and other insects at all times, and that no breeding place or circumstances are permitted on the premises which could encourage the breeding of vermin.

Self-Check 4 – Written Test

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

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

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

1. Sanitation refers to a condition that includes the concepts of “clean” and “safe” (in other words the absence of harmful organisms or substances).
2. Disinfection refers to the process of removing by which micro-organisms and their spores are killed or inactivated so that they cannot spread to other objects and contaminate them.
3. All machinery and equipment used in an abattoir must be so designed and situated as to be easily accessible for cleaning.

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

1. A satisfactory supply of hot water at a minimum temperature of _____must be available at all times during working hours where necessary for cleaning.

   A. 40 – 50 ^{O}C B. 45 – 55 ^{O}C C. 50 – 60 ^{O}C D. All of the above

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

You can ask your teacher for the copy of correct answers

Information Sheet 5- Performing ante mortem examination of animal

5.1 Introduction

Ante-mortem inspection identifies animals not fit for human consumption. Here animals that are down, disabled, diseased, or dead are removed from the food chain and labeled “condemned.” Other animals showing signs of being sick are labeled “suspect” and are segregated from healthy animals for more thorough inspection during processing procedures. Animals or birds are often transported directly from the farm to slaughterhouse. In this process, vets have many different roles. Initially vets may be involved in checking the health and welfare of the animals at some of the stages of transport to the slaughterhouse and once there, in the ante-mortem inspection prior to slaughter.

5.2 Definition of terms

Abattoirs - The word abattoir comes from French word ‘‘abatte’’ which is to mean slaughter, and thus abattoir is defined as any premises or an establishment where approved and registered by the controlling authority for the slaughtering of specific animals for human consumption. It is specific since every species of animals has its requirement. Abattoir or slaughter houses may be owned publically (E.g. Municipal abattoir, state abattoir). It can also be export abattoir or local abattoir.

Lairage It is an area where animals are kept prior to slaughter. The floor should be non-slippery concert floor which should be washed daily in order to minimize surface contamination. Instead of concrete if it is cement, muddy & moist it can contaminate the carcass and is comfortable for the multiplication of bacteria. Animals in lairage pens should not be kept for more than 72hrs because of the risk of cross infection and surface contamination with some pathogenic bacteria such as Salmonella, which are frequently excreted by some animals. The lairage should be divided in to pens where different group of animals can be accommodated. The animals arriving at slaughter house from different sources should be separated in order to avoid fighting; the lairage

must be large enough to accommodate 3 days' supply of stock and must have direct access to the stunning room.

Cleaning means the removal of objectionable matter.

Inspector means a properly trained officer appointed by the controlling authority for the purpose of meat inspection and control of hygiene, and includes a veterinary inspector. The supervision of meat hygiene, including the inspection of meat, should be under the responsibility of a veterinary inspector.

Slaughter animal means any animal lawfully brought into an abattoir for slaughter.

5.3 Inspecting animal before slaughter

Inspection refers to examination of meat and other products for abnormalities and diseases.

Meat hygiene may be defined as an expert supervision of meat and meat products with the objectives of providing whole some meat for human consumption by excluding all factors that endanger the public health.

A proper inspection service consists of a veterinary examination of the live animal (ante-mortem inspection), and examination of the carcass and offal (post-mortem inspection) and animal products, where necessary, laboratory tests of body tissues and fluids. Meat is defined as flesh of animals used as food. The word meat includes both skeletal muscles and visceral organs or edible offal such as kidney, liver, heart, tongue and other visceral organs or offal accepted and used as food. Thus the definition of meat depends on the culture and eating habit of individual society or country.

General examination:

- No animal shall be slaughtered without undergoing AM inspection
- AM Inspection started within 24hrs of delivery
- If 24hrs elapsed after AM, the inspection should be repeated,
- Should be made in well-lighted lairage pen and crush
- 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

Properly identified, accompanied by the relevant information from the holding/fattening areas. Sufficiently rested, Healthy, satisfactory state as regards to welfare. Collecting and recording disease and management history of the animals

General Ante-mortem examination done properly and systematically in two stages.

- Observation of animals both collectively and individually when at rest
- Certain abnormal signs such as labored breathing are easier to detect while the animals are at rest;
- Observation of animals both collectively and individually at motion.
- Whilst other abnormalities, such as lameness, may not be detected until the animals in motion.

Figure 7. A government vet performing ante-mortem inspection on live pigs

Record the detail information and parameter on ante-mortem inspection card

Table 2 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----------
The 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**----------

Self-Check 5 – Written Test

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

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

Test I. Write true if the statement is correct/False if it is incorrect for the following questions (4 point each).

1. Lairage is an area where animals are kept prior to slaughter
2. A proper inspection service consists of a veterinary examination of the live animal and examination of the carcass and offal.

Test II. Choose the best answer for the following questions (4 point each).

1. Animals in lairage pens should not be kept for more than ____hrs because of the risk of cross infection and surface contamination with some pathogenic bacteria.
   A. 72 hrs B.36 hrs C. 42hrs D. 52 hrs
2. _____refers to examination of meat and other products for abnormalities and diseases.
   A. Inspection
   B. Slaughter
   C. Cleaning
   D. Bleeding

Test III. Short Answer Questions (4 point)

1. General Ante-mortem examination done properly and systematically in two stages. Write and discuss these stages.

Note: Satisfactory rating - 10 points Unsatisfactory - below 10 points

You can ask your teacher for the copy of correct answers

Information Sheet 6- Carrying out external assessment of the animal and outward signs of abnormalities

6.1 Introduction

Ante-mortem examination of meat animals is of prime importance and the initial step in detection of any sign of disease, distress, injury etc. which helps in taking appropriate decision before slaughter of animal. Ante-mortem inspection should commence by observing animals when they are unloaded. At this time, a declaration of health and origin must be provided for all animals by the owner of the slaughter stock and recorded by the abattoir owner and such health declaration must contain the following information – date of delivery; name and address of owner or farm; number of animals and specie(s); health status of the herd(s) including mortality rate; and medication, if given as well as withdrawal periods and dates.

6.2 External assessment of the animal and outward signs of abnormalities

On the day of arrival at the abattoir animal must be inspected properly and systematically under adequate natural or artificial lighting at the lairages pens, and the inspection must be repeated on the day of slaughter if the slaughter is not done within 24 hours of arrival. Only animals that are judged to be sufficiently rested should proceed to slaughter, but should not be withheld from slaughter any longer than necessary. An animal may have dirty hide, skin or fleece, if it is suspected that a forbidden substance has been administered to it or an animal which is on the point of giving birth or which has given birth in transit or lairage may not be slaughtered;

Table 3 Inspection of live animals, sign of health and sickness

No	Signs of health	Signs of sickness
1	Active and alert	Inactive, dull and hanging head
2	Glossy (shiny) bright coat	Rough, dull coat
3	Skin – loose and elastic	Skin - sticky (tight skin)
4	Muzzle - moist and wet, cool	Dry muzzle, warm
5	Clear bright eyes	Dull, sunken and discharging eyes
6	Breathing – easy and regular	Difficult, rapid and painful breathing
7	Feed and drink normally	Loss of appetite, refusal of food
8	Normal temper	Abnormal behavior
9	Normal dung	Bloody diarrhea
10	Normal temperature	Abnormal temperature
11	Remain in herd	Separate from herd
12	General good body condition	Emaciated body

Self-Check 6 – Written Test

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

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

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

1. On the day of arrival at the abattoir animal must be inspected properly and systematically under adequate natural or artificial lighting.
2. Only animals that are judged to be sufficiently rested should proceed to slaughter.

Test II. Choose the best answer for the following questions (6 point).

1. Which of the following is not sign of abnormality while assessing animal at ante mortem exxamination?
   A. Difficult, rapid and painful breathing
   B. Feed and drink normally
   C. General good body condition
   D. Normal temperature
   E. Glossy (shiny) bright coat

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

You can ask your teacher for the copy of correct answers

Information Sheet 7- Identifying abnormal characteristics of animals prior to slaughter

7.1 Introduction

Ante mortem inspection is the inspection of live animals to ascertain their health condition and fitness for slaughter. Ante mortem inspection takes place at the farm, as animals enter the slaughterhouse and when in the lairage just before slaughter. Ante mortem inspection should be carried out in adequate lighting where the animals can be observed both collectively and individually at rest and motion. The general behavior of animals should be observed, as well as their nutritional status, cleanliness, signs of diseases and abnormalities should be also observed..

7.2 Reasons for ante mortem inspection

- Examine animals for evidence of infectious and zoonotic disease especially those that cannot be detected after slaughter e.g. rabies
- Identify and separate sick from normal animals
- Remove animals dying on transit
- Check for movement permit
- Prevent animals with dangerous and notifiable diseases e.g. anthrax, FMD
- To avoid unnecessary suffering of animals especially those with acute pain e.g animals with fractures, uterine prolapse, post-partum uterine hemorrhage
- Postpone slaughter of fevered/excited animals
- Check for conditions of transport vehicles
- Identify excessively soiled animals and take appropriate action

Some of the abnormalities which are checked on ante mortem examination include:

- Abnormalities in respiration
- Abnormalities in behavior
- Abnormalities in gait
- Abnormalities in posture
- Abnormalities in structure and conformation

- Abnormal discharges or protrusions from body openings
- Abnormal color
- Abnormal odor

Abnormalities in behavior are manifested by one or more of the following signs:

- Walking in circles or show an abnormal gait or posture
- Pushing its head against a wall
- Charging at various objects and acting aggressively
- Showing a dull and anxious expression in the eyes

An abnormal gait in an animal is associated with pain in the legs, chest or abdomen or is an indication of nervous disease.

Abnormal posture in an animal is observed as tucked up abdomen or the animal may stand with an extended head and stretched out feet. The animal may also be laying and have its head turned along its side. When it is unable to rise, it is often called a “downer”.

Abnormalities in structure (conformation) are manifested by:

- Swellings (abscesses) seen commonly in swine
- Enlarged joints
- Umbilical swelling (hernia)
- Enlarged sensitive udder indicative of mastitis
- Enlarged jaw (“lumpy jaw”)
- Bloated abdomen

Some examples of **abnormal discharges** or protrusions from the body are:

- Discharges from the nose, excessive saliva from the mouth, afterbirth
- Protruding from the vulva, intestine
- Protruding from the rectum (prolapsed rectum) or uterus
- Protruding from the vagina (prolapsed uterus)

Self-Check 7– Written Test

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

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

Test I. Choose the best answer for the following questions (4 point each).

1. What are the reasons for ante mortem inspection?
   A. Identify and separate sick from normal animals
   B. Remove animals dying on transit
   C. Check for movement permit
   D. Abnormalities in structure and conformation
   E. All of the above
2. Abnormalities in behavior are manifested by one or more of the following signs:
   A. Walking in circles or show an abnormal gait or posture
   B. Pushing its head against a wall
   C. Charging at various objects and acting aggressively
   D. Showing a dull and anxious expression in the eyes
   E. All of the above

Test II. Short Answer Questions (4 point)

1. What are the abnormalities which are checked on ante mortem examination?

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

You can ask your teacher for the copy of correct answers

Information Sheet 8- Passing judgment for slaughter based on ante mortem examination

8.1 Guidelines and principles of ante mortem examination

- 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
- Presence of assistants to hold animals during inspection

Animals should be inspected:

- At rest (static position): to assess posture, detect lameness, to study their behavior (excited or not)
- In moving (motion) condition

Carrying out ante-mortem inspection (Procedure)

1) Check for movement permit before animals are offloaded
2) Observe the animals as they off load
3) Inspect animals at the lairages while at rest and in motion for general behaviour, level of nutrition, obvious signs of disease and any other abnormalities e.g starring coat, tacked abdomen, arched back, circling, ataxia, salivation, lachrymation etc.
4) For animals found to be sick or in poor condition, record species, age, condition, colour and identification marks, their place of origin and travel routes for easy of follow-up. Then send them for emergency slaughter.
5) 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. After the autopsy. The cadaver is incinerated or buried.

6) Animals found fit for human consumption are taken for slaughter
7) Ante-mortem inspection should be carried out under adequate natural or artificial lighting.
8) The inspection should be repeated if 24 hrs have elapsed since the last inspection or/and at any time if required by the veterinary surgeon in-charge of the slaughterhouse.

8.2 Judgment (decision) categories at ante-mortem inspection:

1) Approved for slaughter without any restriction*:* This judgment is passed, if

- No evidence of disease is noted.

2) Condemned for slaughter: This decision is made

- If specific contagious diseases or zoonotic diseases have been detected
- If the certificate accompanying the animal reveals the information that the animal has been treated with antibiotics.
- Emaciated animals, and those animals carrying toxic residues. Immature and weak

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

NOTICE: Emergency slaughter should not be confused with ***causality slaughter*** refers to the slaughter of animal suffering from chronic illness e.g. milk fever, obturator paralysis.

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.

Repetition of ante-mortem inspection:

Ante-mortem inspection shall be repeated, if

- the slaughter has not been effected within 24hrs
- Additional information or diagnostic test are required
- The animal reveals obscure dubious clinical signs during the initial ante-mortem inspection.

Postponing the slaughter:

- 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.

Self-Check 8– Written Test

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

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

Test I. Write true if the statement is correct/False if it is incorrect for the following questions (4 point each).

1. No animal shall be slaughtered without undergoing ante-mortem inspection.
2. Every animal should be properly identified and accompanied by certificate, which indicates the origin of the animal.
3. The slaughter of the animal may be postponed, when curable disease is diagnosed.

Test II. Choose the best answer for the following questions (6 point).

1. If no evidence of disease is noted what was the final judgement the ante mortem inspection?
   A. Emergency slaughtered
   B. Authorization for slaughter delayed
   C. Approved for slaughter without any restriction
   D. Condemned for slaughter:
   E. All of the above

Test III. Short Answer Questions (4 point)

1. Describe and discuss categories of ante mortem decisions.

Note: Satisfactory rating - 11 points **Unsatisfactory - below 11 points**

You can ask your teacher for the copy of correct answers

Information Sheet 9- Moving the animal to slaughtering room

9.1 Introduction

Transportation of animals to slaughter points. While transporting animals to the slaughterhouse, one should always be conscious of the welfare of the animals. They should as much as possible be transported in a humane manner. In this regard, care should be taken to:

- Maintain the nutritional value and health status of the animal. They should be 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. Efforts should be made to avoid all forms of stress as stress affects the keeping quality of meat. This is mainly associated with low glycogen and lactic acid giving less than expected pH fall after slaughter. For example, beef from stressed animals is dark, firm and dry. To reduce injury, separate horned from polled animals, aggressive and females in estrus from calm animals, and animals from different origins to prevent fighting.

Resting of animals at lairages

- Fatigued and excited animals should be rested before slaughter to enhance the keeping quality of meat. Animals should rest for between 12-24 hrs (maximum 36hrs) before they are slaughtered. During rest, animals 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. This requirement serves to prevent carcass contamination if the stomach is accidentally punctured.

9.2 Pre slaughter care of slaughter animals

Husbandry of food animals for human consumption could be accepted provided that the production methods are in compliance with best practices for humane and ethical food production. The humane and ethical husbandry practices are those that are responsive to the five freedoms of animal welfare:

- **Freedom from Hunger and Thirst** by ready access to diet and fresh water to maintain full health and vigor.
- **Freedom from Discomfort** by providing an appropriate environment including shelter and a comfortable resting area.
- **Freedom from Pain, Injury or Disease** by prevention or rapid diagnosis and treatment.
- **Freedom to Express Normal Behaviour** by providing sufficient space, proper facilities and company of the animal's own kind.
- **Freedom from Fear and Distress** by ensuring conditions and treatment which avoid mental suffering.

Animal welfare issue opposes to any method of slaughter which does not quickly render the animal totally unconscious prior to being killed. Animal welfare issue recognizes that identification and processing of farm animals often involves castration, dehorning, debeaking, branding, tail docking, ear tagging, nose rings and tooth pulling among other invasive procedures.

The following factors should be considered for animals that are going to be slaughtered for human consumption:

- The fatigued and exited animals must be given rest before slaughter. A period of 12 to 24 hours with a maximum of 36 hours detention and rest in a lairage is essential. The duration of resting period depends on species of the animals, age, sex, condition, time of the year, length of the journey and method of transportation.
- Animals should receive ample potable drinking water during their detention in the lairage. This helps to lower the bacterial load in the intestine and facilitates removal of the hide during dressing of the carcass.

- Withholding food from cattle for a period of 6 hours prior to slaughter minimizes the migration of bacteria from the intestinal tract during digestion. Moreover fastened animals bleed better, carcass is easier to dress and has a brighter appearance.
- Regular cleaning and disinfection of a lairage to lower the risk of cross contamination.
- Animals should be kept in well ventilated, dry and hygienic lairage.
- The animals which are badly soiled, dirty and doggy should be properly washed.
- The lairage should be 10m away from slaughter house. Lairage areas for each specific abattoir should therefore be assessed relative to expected throughput. Pen areas required for each species are for cattle 1.7m2/head, for pigs/sheep 0.35m2/head and for goats' 0.25m2/head.
- Sufficient space should be provided to each animal.
- Aggressive animals should be isolated in lairage.
- Females in oestrus should not be kept with males in lairage.
- Design of lairage pen should allow free movement of stock.
- Stock should be kept in their original social groups as far as possible and there should be no mixing within the last 24-48 hours before slaughter.
- Avoid pre-slaughter stress to prevent dark, firm and dry meat.

Self-Check 9– Written Test

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

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

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

1. Fatigued and excited animals should be rested before slaughter to enhance the keeping quality of meat.
2. Animals should rest for between 12-24 hrs (maximum 36hrs) before they are slaughtered
3. Withholding food from cattle for a period of 18 hours prior to slaughter minimizes the migration of bacteria from the intestinal tract during digestion.

Test II. Choose the best answer for the following questions (6 point).

1. Animals need to be fasted for at least _____before slaughter to reduce stomach contents.
   A. 20 hours
   B. 15 hours
   C. 2 hours
   D. 6 hours

Test III. Short Answer Questions (5point)

1. List and discuss breifly the animal walfare freedom.

Note: Satisfactory rating - 13 points **Unsatisfactory - below 13 points**

You can ask your teacher for the copy of correct answers

Information Sheet 10- Carrying out humane methods of slaughtering

10.1 Slaughtering and dressing operations

This is the process of putting the animal to death. It involves, stunning, bleeding, flaying, evisceration, carcass splitting (cattle/large stock), trimming and washing, chilling and freezing.

Stunning is a technical process that induces immediate unconsciousness and insensibility in animals, so that slaughter can be performed without avoidable fear, anxiety, pain, suffering and distress without affecting the quality of meat or offal. When ready for slaughter, animals should be driven to the stunning area in a quiet and orderly manner without undue fuss and noise. Animals should never be beaten nor have their tails twisted. Animals should be led in single file into the stunning area where they can be held in appropriate restraining devices before stunning. It is very important that slaughter animals should be properly restrained before stunning or bleeding. Restraining means restricting the movement of an animal to ensure stability / holding the animal in a correct position, so that stunning or sticking can be carried out accurately and properly. The objectives of stunning are:

- To achieve complete bleeding
- To prevent unnecessary suffering from pain to animal

Precautions and the general principles that apply to all stunning methods are:

- Instruments used for stunning must be in a good working condition
- The animal must be restrained/casted properly
- A well-trained and experienced establishment employee must operate stunning devices
- Animals need to be delivered to the stunning area with a minimum of excitement or discomfort

10.2 The acceptable methods of stunning

Sledge hammer: it contains a long handle. It is 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.

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. If a no penetrating captive bolt is used the animal may revive unless it is bled promptly.

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.

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

Carbon dioxide: A CO_2 gas chamber is designed on the principle that carbon dioxide is heavier than normal atmospheric air. Birds may be stunned using CO_2 and Argon gas while they remain in their crates. Pigs are also gassed using CO_2. Pig becomes unconscious by 70% CO_2 within 20-25 seconds.

Bleeding: Bleeding is effected by severing the neck at the level of the jugular and hanging the animal upside down on the rails

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 is 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.

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.

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.

Washing: After evisceration, the carcass is washed to remove any surface contamination with blood and intestinal contents. It is important to use potable water to wash carcasses as any other water can introduce pathogens on to the carcass. Both hot and cold water should be provided in the slaughterhouse. Carcasses should not be wiped with any type of cloth.

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 animals

Figure 8. Process of slaughtering animals

Self-Check 10– Written Test

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

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

Test I. Write true if the statement is correct/False if it is incorrect for the following questions (6 point each).

1. Stunning is a technical process that induces immediate unconsciousness and insensibility in animals.
2. Carcass splitting is the removal of internal organs such as stomach, liver, spleen, intestines and lungs.
3. Bleeding is effected by severing the neck at the level of the jugular and hanging the animal upside own on the rails.

Test II. Choose the best answer for the following questions (6 point).

1. _____meant to remove contaminated and unaesthetic parts of the carcass.
   A. Trimming
   B. Evisceration
   C. Flaying
   D. Stunning

Test III. Short Answer Questions (10 point)

1. What are the objectives of stunning animal?
2. Write the precautions and the general principles that apply to all stunning methods

Note: Satisfactory rating - 17 points **Unsatisfactory - below 17 points**

You can ask your teacher for the copy of correct answers

Operation Sheet: 1. Procedure of Ante mortem Inspection

Procedure for ante mortem inspection of animal

Objective: Conducting ante mortem inspection of animal

Materials: (Crush, record book, pen, thermometer, animal)

Procedure:

2. Animals should be inspected in a standing position and in motion, and while they are not excited. Observed abnormalities and signs of disease; species and behaviour of animals; in sick or suspected diseased animals, notice should be taken of age, colour and specific markings; Cleanliness of slaughter animals.
3. Particular attention should be paid to the following details: manner of standing and movement; state of nutrition; reaction to environment; condition of hide, skin, hair and wool; temperature, respiratory…
4. No animal which has been received into a slaughter hall for the purpose of being slaughtered shall be removed from the slaughter hall before being slaughtered except with the written consent of the Qualified Veterinary Doctor.
5. An animal declared as “suspect” on ante-mortem inspection but which does not plainly show any disease or condition that would cause its entire carcass to be condemned shall maintain its identity as “suspect” until its carcass and all organs are finally inspected by the Qualified Veterinary Doctor.
6. No animal in a febrile condition shall be permitted for slaughter.
7. Animals presented for slaughter and found in a dying condition on the premises of a factory due to recent disease shall be marked as “condemned” and disposed of as provided for “condemned” animals.
8. Every animal which, upon examination, is found to show symptoms of or is suspected of being diseased or animals declared as “suspect” shall at once be removed for treatment to such special pen and kept there for observation for such period as may be considered necessary to ascertain whether the animal is diseased or not.

9. Where signs indicate a systemic involvement, a communicable disease, or toxicity from chemical or biological agents which do or may render the meat unsound, the animal so affected should be withheld from slaughter and condemned forthwith as unfit for human consumption
10. Animals' exhibiting normal behaviour but known to have been treated or given drugs and to be carrying consequent residues or which are carrying residues from other sources, should be either condemned or withheld from slaughter until the residues are excreted
11. During the inspection, record should be taken

LAP TEST

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

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

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

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

Lap Test Title: Procedure for Ante mortem Inspection

Undertaking ante mortem Inspection

Task: Perform ante mortem inspection of animal

LG 62	LO 3. Carry out Post-mortem Examination

Instruction sheet

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

- Ensuring complete bleeding prior to dissection
- Conducting dissection using appropriate techniques and equipment
- Inspecting organs, tissues and structures using post mortem inspection procedures
- Taking and preparing samples of organs, tissues and fluid
- Conducting inspection works on meat
- Disposing unfit offal and waste products

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:

- Ensure complete bleeding prior to dissection
- Conduct dissection using appropriate techniques and equipment
- Inspect organs, tissues and structures using post mortem inspection procedures
- Take and prepare samples of organs, tissues and fluid
- Conduct inspection works on meat
- Dispose unfit offal and waste products

Learning Instructions:

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

Information Sheet 1- Ensuring complete bleeding prior to dissection

1.1 Definition of terms

Slaughter Animal: means animals intended for human consumption (Cattle, sheep, goat, swine, camel, and poultry)

Bleeding: - 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. In general bleeding of animal throughout the world varies depending on

Hauling: hanging the animal down ward .the animal bleed well when the animal is hanging downward rather than when bleed in horizontal position .this is due to the low of gravity.

Slaughter: killing of an animal by severing the major blood vessels in the neck region, with or without stunning.

Stunning: is the process of making the animal unconscious. It is mostly practiced in most 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

1.2 Bleeding:

Bleeding is effected by severing the neck at the level of the jugular and hanging the animal upside down on the rails. 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 intercostal 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.

1.3 The objectives of bleeding

- To kill the animal with minimal damage to the carcass and
- To remove blood quickly as much as possible as blood is ideal medium for growth of bacteria.

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 4. The minimum time allowed for bleeding and the amount of blood per species are:

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

Self-Check 1 – Written Test

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

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

Test I. Write true if the statement is correct/False if it is incorrect for the following questions (4 point each).

1. Slaughter is killing of an animal by severing the major blood vessels in the neck region, with or without stunning.
2. Horizontal bleeding is more advantagious the vertical bleeding.
3. . At least 5-6 minutes must be allowed for bleeding of pigs carcass.

Test II. Choose the best answer for the following questions (4 point).

1. What is the minimum time allowed for bleeding of bovine carcass?
   A. 6 minutes
   B. 5 minutes
   C. 5 minutes
   D. 7 minutes

Test III. Short Answer Questions (6 point)

1. Describe the purpose of bleeding.

Note: Satisfactory rating - 11 points **Unsatisfactory - below 11 points**

You can ask your teacher for the copy of correct answers

Information Sheet 2- Conducting dissection using appropriate techniques and equipment

1.1 Introduction

Dissection: is the process of cutting into a dead animal body apart or separating tissues as, for example, in the study of anatomy or in the course of a surgical procedure. In the case of study dissection has its own importance. Helps student learn about the internal structures of animals. Helps the trainees learn how the tissues and organs interrelated. Gives the trainees an appreciation of the complexity of organisms in a hands on learning environment.

The splitting of the carcass is an exacting task as the two halves must be of equal size and weight for trading purposes, economical cuts and easy handling of the carcass. Band saws are most frequently used. The operator is positioned behind the carcass and starts sawing by placing the blade on the vertebra which is visible between the hind legs. The blade guides should be pressed against the carcass surface while sawing to prevent the blade from bending. Hot water at 82 °C must be available for sterilizing the saw, especially after contamination.

2.2 Carcass splitting/Dissection and Trimming

1. Halving or Splitting the Carcasses

- **Carcass splitting:** Carcasses are split carefully through the backbone into two equal portions. Carcasses must be sawn through to simplify handling during loading and to make possible an effective carcass inspection.
  - ✓ The splitting can be accomplished manually using a pang and or an axe or by use of an electrical power saw. Because of the large numbers of carcasses being handled, most abattoirs use electric carcass saws.
  - ✓ Special attention must be given to the following while carcasses are being sawn:
    - ❖ Carcasses must be sawn straight down the middle so as not to damage expensive cuts. If the carcass is cut off-center, this may affect its classification

The present development relates to a kind of beef carcass auto-splitting machine, half device and cohesion device and jacking system in work box are split including the work box with base, on work box, work box includes holding room, drive chamber and Transmission Room tightly, Transmission Room is positioned at the top for holding room and drive chamber tightly, in the outside for holding room tightly, the support frame with guide rail is set, the location-plate of two pieces of circular arc types is provided with the outside of support frame, support frame and location-plate are fixedly connected between the extending part of work roof box and the extending part of base plate. C-type holding arm of the present invention can hold beef carcass tightly, beef carcass is set to be fitted on two pieces of circular arc type location-plates, so that in gap of the backbone between two pieces of circular arc type location-plates, saw blade carries out splitting half to beef carcass from the bottom to top under jacking system drive along guide rail, it ensure that and split precision partly, reduce bone and flesh waste, improve the operating efficiency for splitting half operation, ensure that the appearance for splitting half section.

Carcass splitting machine: Which main used to cutting cattle carcass into half carcass for chilling and other processing.

Operation instruction

- The user have to check motor oil is enough and blade moving direction is stable
- When the cattle carcass arrived in position then
- Put slitting saw between two hinds legs then turn on working with meanwhile the staffs have to keep pressure the saw and cutting carcass through back side of carcass
- When splitting saw working the user will open cleaning valve of saw to cleaning oil and meat on saw blade in order to make saw working smooth
- Meets national and international requirements for hygiene and safety

2. **Trimming of Carcasses:** After inspection and before the final washing, all approved carcasses can be finally trimmed to remove contaminated and unaesthetic parts of the carcass. The aim of trimming is to enhance the aesthetic value of the carcass. The following removed or cut off:

- Spinal cord
- Left-over bits of skin and intestines
- Portions of male and female genitals
- Bloody membranes on the inside of the neck, and the aorta

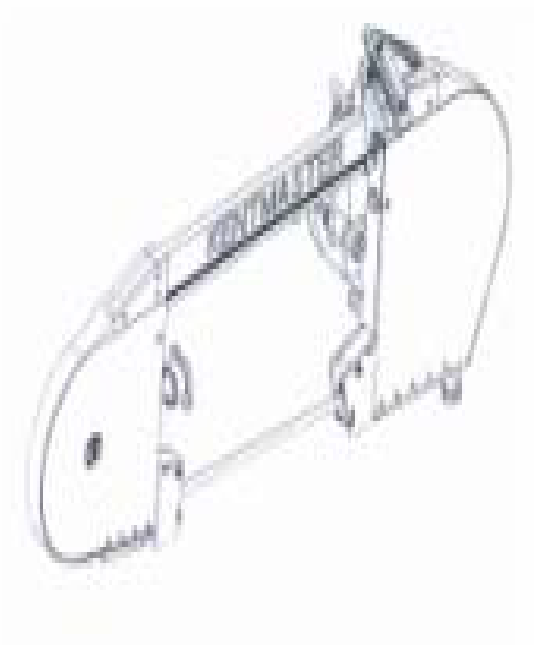

Figure 9. Carcass splitting machine

Self-Check 2 – Written Test

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

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

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

1. Carcass splitting machine is main used to cutting cattle carcass into half carcass for chilling and other processing.
2. After inspection and before the final washing, all approved carcasses can be finally trimmed to remove contaminated and unaesthetic parts of the carcass.

Test II. Choose the best answer for the following questions (6 point).

1. Which one of the following is not the importance of animal dissection?
   A. Helps student learn about the internal structures of animals.
   B. Helps the trainees learn how the tissues and organs interrelated.
   C. Gives the trainees an appreciation of the complexity of organisms in a hands on learning environment.
   D. None of the above

Test II. Short Answer Questions (10 point)

1. Describe parts of carcass unfit for human consumption.
2. What is animal dissection? Discuss its importance and the cons.

Note: Satisfactory rating - 13 points **Unsatisfactory - below 13 points**

You can ask your teacher for the copy of correct answers

Information Sheet 3- Inspecting organs, tissues and structures using post mortem inspection procedures

3.1 Introduction

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. Post-mortem meat Inspection is a systematic process of examination of the dressed carcass, pluck (liver, heart, lungs and lymph nodes), and head aimed at identification of known and unknown diseases or conditions. Routine post-mortem inspection should be carried out as soon as possible after carcass dressing is completed. Beef carcasses set rapidly and if inspection is delayed particularly in cold weather, the examination of the carcass becomes more difficult. Post-mortem inspection aims to protect consumers against zoonoses and unwholesome meat. 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

3.2 Definition of terminologies

Carcass: Dressed body of animal (cattle, buffalo, sheep, goat, pig or poultry).

Dressing: separation of the body of an animal in to a carcass and other edible and inedible parts.

Edible organs include tongue, heart, liver, kidney and part of intestine. Inedible organs are spleen.

Condemned: In relation to a slaughter animal or meat, means inspected and judged as, or otherwise officially determined to be, unfit for human consumption and requiring destruction.

Total condemnation: Means the entire carcass and offal are condemned (Judgement symbol T).

Partial condemnation: Means only parts of the slaughtered animal are condemned, while others are judged otherwise (Judgement symbol D for the condemned diseased or defective parts).

Contamination: Means objectionable matter, and includes substances and/or microorganisms that make fresh meat unsafe and/or unwholesome.

Controlling authority: Means the official authority charged by the government with the control of meat hygiene, including meat inspection.

Disease or defect: Means a pathological change or other abnormality.

Disinfection: of plant, facilities and equipment, means the reduction, without adversely affecting the meat, by means of hygienically satisfactory chemical agents and/or physical methods, of the number of microorganisms to a minimum.

Dressing: means the progressive separation on the dressing floor of a slaughter animal into a carcass (or sides of a carcass), offal and inedible by-products and may include the removal of the head. Examples of dressing include the removal of the head, hide or skin, genital organs, urinary bladder, feet, and in lactating animals, the removal of the udder.

Edible offal: in relation to slaughtered animals means offal that have been passed as fit for human consumption.

Fit for human consumption: in relation to meat means meat that has been passed by an inspector as safe and wholesome, unless found unwholesome in subsequent examinations, which may include laboratory tests.

Fresh meat: Means meat that has not yet been treated in any way other than by modified atmosphere packaging or vacuum packaging to ensure its preservation, except that if it has been subjected only to refrigeration, it continues to be considered fresh for the purposes of this Code.

Inedible: Means inspected and judged to be, or otherwise officially determined to be, unfit for human consumption but not requiring destruction.

Contaminant: Means any substance not intentionally added to food, which is present in such food as a result of the production (including operations carried out in crop husbandry, animal husbandry and veterinary medicine), manufacture, processing, preparation, treatment, packing, packaging, transport or holding of such food or as a result of environmental contamination. The term does not include insect fragments, rodent hairs and other extraneous matter.

Safe and wholesome: Refers to meat that has been passed as fit for human consumption using the criteria that it:

- Will not cause food borne infection or intoxication when properly handled and prepared with respect to the intended use;
- Does not contain residues in excess of established Codex limits;
- Is free of obvious contamination;
- Is free of defects that are generally recognized as objectionable to consumers;
- Has been produced under adequate hygiene control; and
- Has not been treated with illegal substances as specified in relevant national legislation.

3.3 Principles of post-mortem inspection:

Ensure that

- The slaughter hall and equipments are clean
- The sewage system is functioning properly
- The availability of adequate supply of potable water
- Availability of adequate light
- Presence of adequate personnel and their hygienic status.

Guidelines of post-mortem inspection

- 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

General approach:

- Routine postmortem examination of a carcass should be carried out as soon as possible after the completion of dressing in order to detect any abnormalities so that products only conditionally fit for human consumption are not passed as food.

There are three cardinal principles used in meat inspection. They include:

Visual examination of animal carcass and organs: This is important for purposes of animal identification (species, sex, age), to determine the nutritional state of the animal and state of bleeding, detect bruises, deformities, edema, peritonitis, discolorations and general contamination. Examination of gums reveal vesicles or erosions arising from FMD rinderpest and mucosal disease. Examination of lungs may reveal pneumonia, abscesses and TB lesions.

Palpation: Identify abscesses, abnormal growths (tumors), deformities, abnormal consistency of fat and various body organs, hydatid cysts and TB lesions in the lungs.

Incisions: These are made with sharp knives to show clean undistorted surfaces. Standard incision are made to identify Cysticercosis in beef and pork muscles (tongue, masseters, triceps brachii), liver flukes in livers, aspiration pneumonia in lungs, abscesses and congestion in lymph nodes

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

Designated abattoir personnel should prepare the head in a manner that makes it suitable for inspection. In general this preparation includes:

- Immediately separate the head from the body, placed in the head holder
- Skinning the head; and removing the ears, third eyelid, eyes, external ear; horns.
- Cleaning and washing with potable water, with emphasis on oral and nasal cavity the head;
- Placing the head on the inspection rack with all lymph nodes in place and the tongue still attached

Inspectors will:

- Determine the age of the animal by reviewing reliable birth date documentation or by examining the lower incisor teeth.
- Conduct a visual examination of the inner and outer surfaces of the head.
  - ✓ The inspector will be looking for evidence of contamination as well as for nasal discharges, ear mites, dental and cheek abnormalities and conditions of the eye.
  - ✓ Visually observe the head to ensure that it is free of any hair, hide, horns, ingesta or any other type of contamination.
  - ✓ Common areas of contamination include the base of the skull, the area where the horns were attached and inside the mouth.
  - ✓ The head should be held for trimming and re-inspection if there is any contamination or other dressing defects.
  - ✓ The eyes should be closely examined for any evidence of cancer eye. Unless the cheek meat is removed on the kill floor the tonsils should be removed under the supervision of an Inspector.

- 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) submaxillary (mandibular);
  c) Left and Right retropharyngeal
- Visually examine, palpate and incise (if necessary) the tongue.
  - ✓ This is done to check for abscesses, Actinobacillosis (wooden tongue) and other abnormalities. Localized conditions such as scars, sores and erosions are trimmed.
- Upon completing the inspection of the head, the operator in charge of inspection removes the tonsils and pharynx. (Inedible).

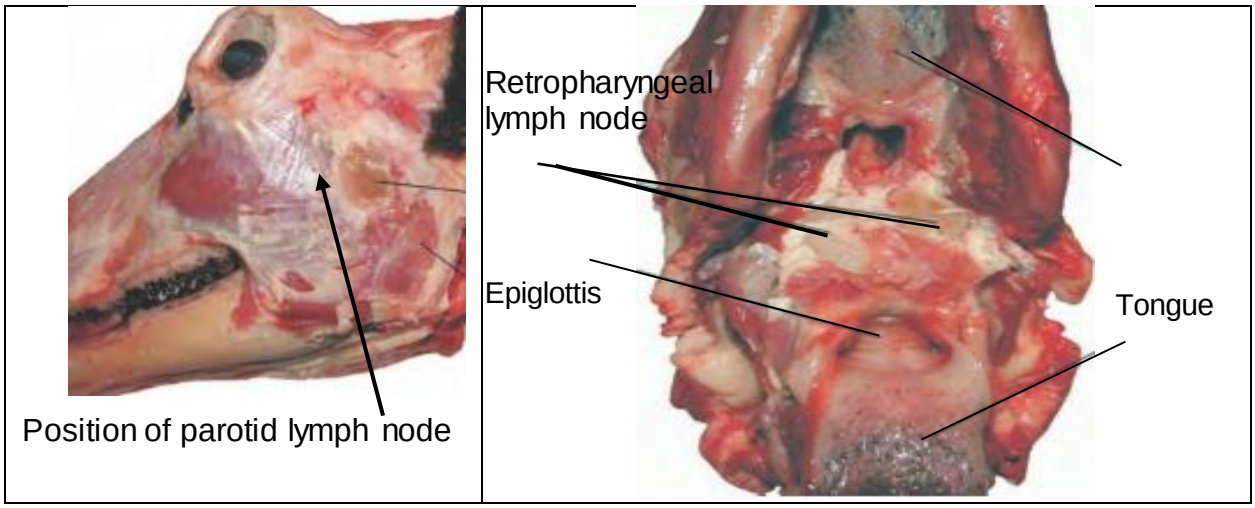

Figure 10. Position of Head Lymph Nodes

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; in addition one incision into triceps brachii, 5 cm behind the elbow, should be made.

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.
- The liver shouldn't be incised unless a deep lesion is palpated. For cattle over six weeks of age, incise as deemed appropriate to detect liver flukes.
- For sheep, pigs and game, incise as deemed appropriate for parasite.
- Lymph nodes Portal (hepatic) view and incise.
- Examine for fatty liver, faciolosis, actinobacillosis, Cysticercus bovis and certain parasitic conditions.

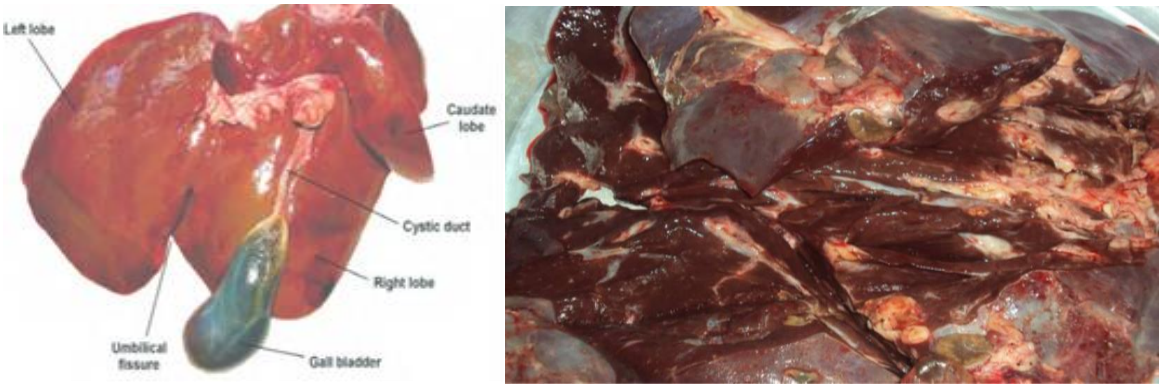

Figure 11. Liver cirrhosis in cattle

Heart

- Examine the exterior and interior surfaces of the heart visually after the removal of the pericardium, including the heart valves should be observed visually.
- 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.

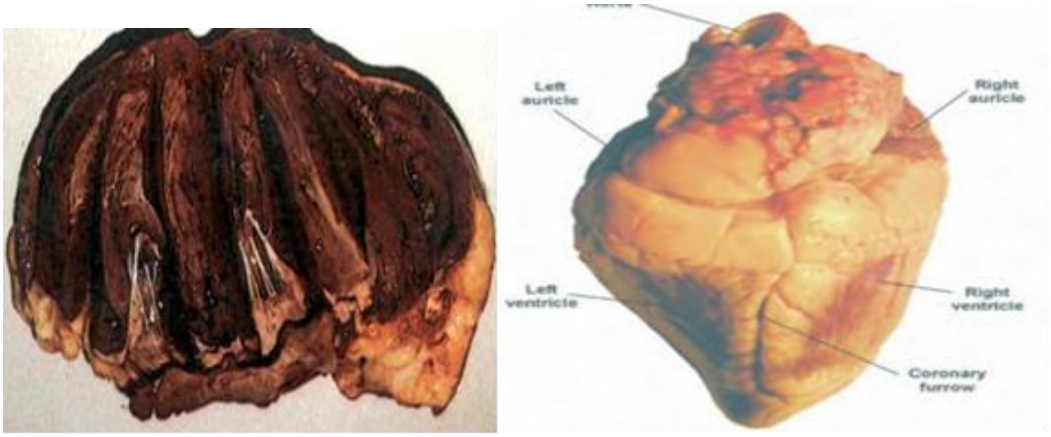

Figure 12. Heart Inspection

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. If any lesions are detected, by palpation, the lungs are incised.
- Examine the left and right bronchial, cranial and caudal mediastinal lymph nodes. These nodes should be incised 2 or 3 times.
- 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.

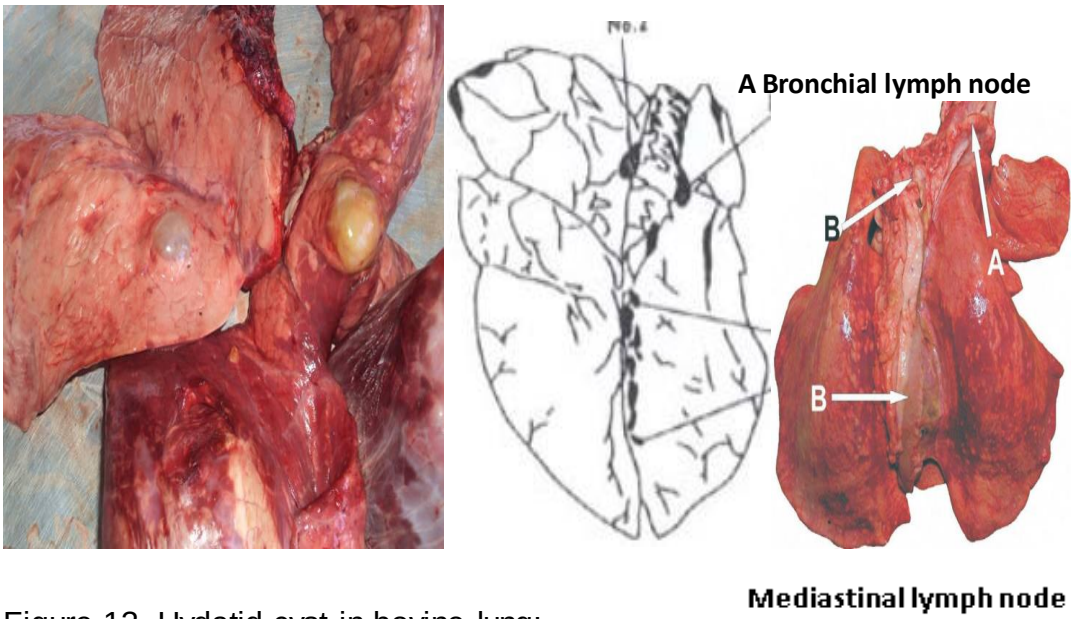

Figure 13. Hydatid cyst in bovine lung;

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 submaxillary 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.

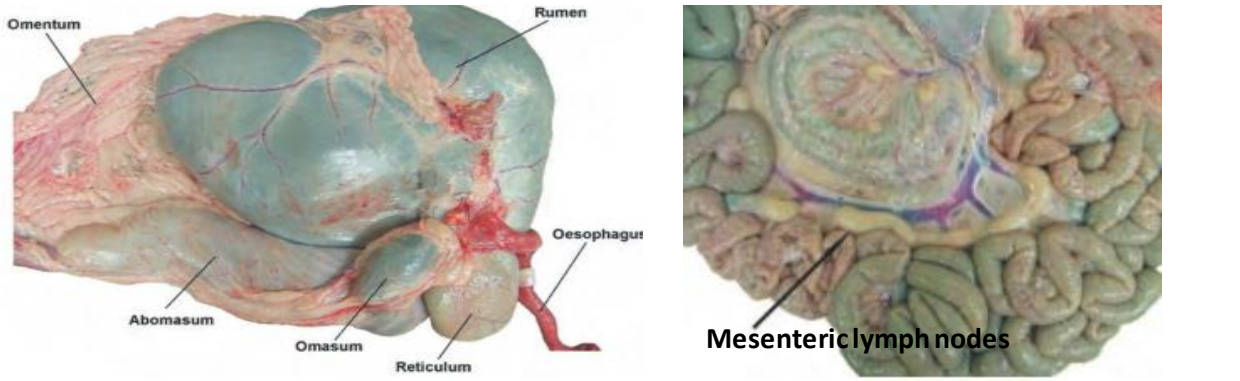

Figure 14. Inspection of GIT

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.

After approval, the red and green viscera are washed separately.

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

Designated abattoir personnel will prepare

1. The carcass in a manner that makes it suitable for inspection. Proper presentation includes:
   - Removing the viscera (internal organs);
   - Splitting the carcass;
   - Presenting the carcass before final trimming and/or washing
2. A system will be in place to ensure that the carcass can be matched up with the head and all internal organs until such time as all PM inspections have been completed.

This inspection includes the:

1) The registered inspector must inspect a carcass by means of **observation, palpation**, **smell** and, where necessary, **incision** and must take into consideration
   - Its state of nutrition; its color; its odor; its symmetry;
   - The efficiency of its bleeding; condition of serous membranes (pleura and peritoneum)
   - Cleanliness and the presence of any contamination;
   - Its pathological conditions; any parasitic infestation;
   - Any injection marks; any bruising and injuries;
   - Any abnormalities of muscles, bones, tendons, joints or other tissues; and
   - The age and sex of the animal from which it was derived.
2) Conduct a visual inspection of the entire carcass. (Including Joints, musculature, exposed bones, joints, tendon → Outer muscular surfaces, Diaphragm→Peritoneum →Pleura→Neck).
3) Palpate and incise (if deemed necessary) any observed abnormalities.
4) Remove the entire spinal cord from all carcasses.
5) Identify all carcasses, or portions thereof, that are condemned so that they will be handled in a manner that ensures that contamination of equipment, meat, or meat products, from other carcasses, does not occur. No part of a condemned carcass can be used for human consumption
6) The main carcass lymph nodes – being the 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).

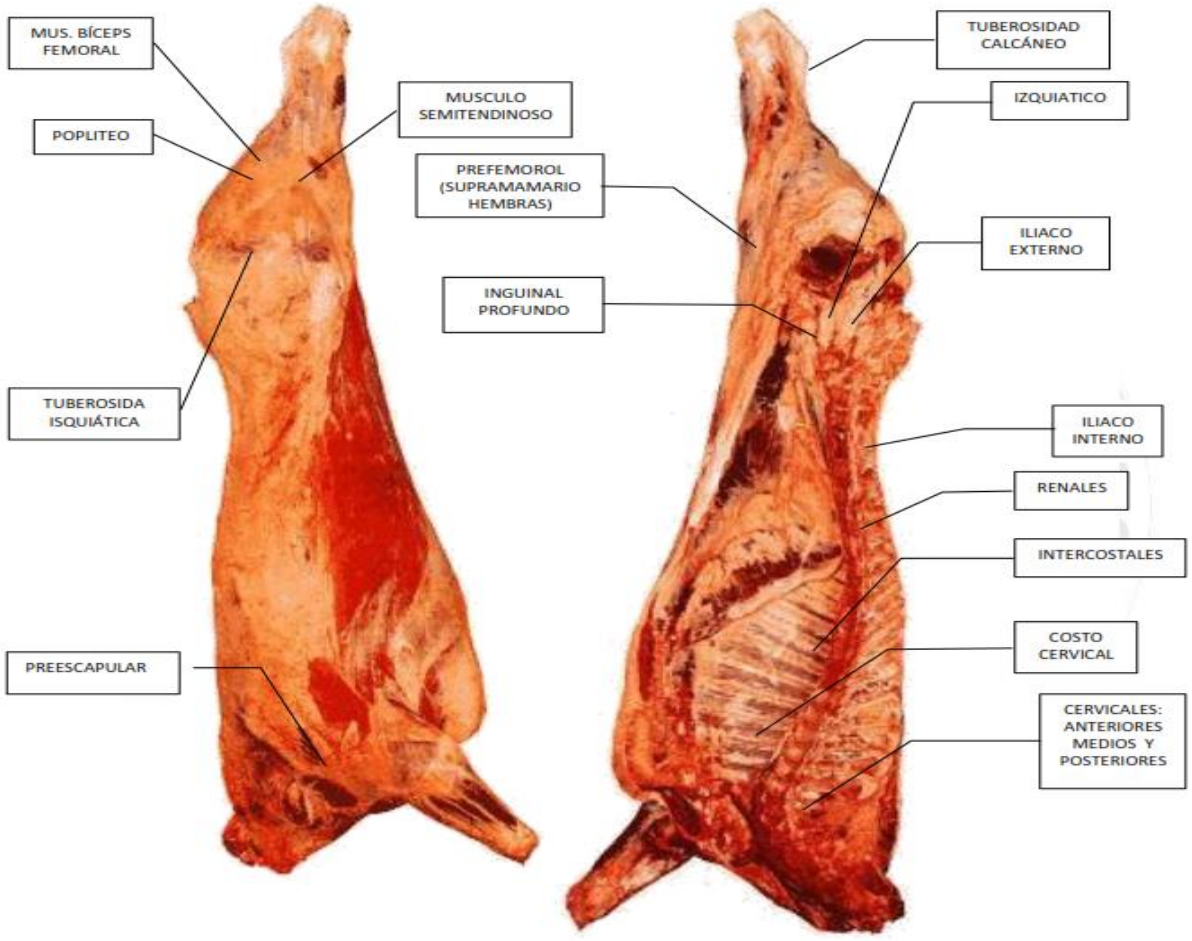

Figure 15. Anatomic location of lymph nodes in carcasses

Self-Check 3 – Written Test

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

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

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

1. Cndemnation is separation of the body of an animal in to a carcass and other edible and inedible parts.
2. Inedible organs means unfit for human consumption but not requiring destruction.

Test II. Choose the best answer for the following questions (6 point).

1. Wich one of the following is not the principles of post-mortem inspection?
   A. The slaughter hall and equipments are clean
   B. The sewage system is functioning properly
   C. The availability of adequate supply of potable water
   D. Availability of adequate light
   E. **None of the above**
2. A systematic approach of meat inspection includes examination of the:
   A. Structures of the head;
   B. Organs (viscera) in the thoracic (chest) cavity;
   C. Viscera in the abdomen;
   D. Carcass
   E. All of the obove

Test III. Short Answer Questions (10 point)

2. Describe and discuss the cardinal principles used in meat inspection.
3. Briefly discuss head inspection procedure

Note: Satisfactory rating - 16 points **Unsatisfactory - below 16 points**

You can ask your teacher for the copy of correct answers

Information Sheet 4- Taking and preparing samples of organs, tissues and fluid

4.1 Introduction

Recognizing and recording abnormalities are enhanced by developing a consistent routine in the dissection and collection of tissues. There is often a tendency to move quickly to the suspected lesion or body system, which risks missing important information. A good necropsy involves paying attention to **ALL** the clues that can be provided, so the routine has to be followed, with attention to detail at every step.

4.2 The consistent routine entails 6 steps:

1. **Obtain the history:** A complete individual animal and herd history should be obtained. This history should include: age, breed, and sex of affected animals, husbandry conditions (including housing, feed), clinical signs, and any treatments administered and whether the animal died or was euthanized.
2. **External examination:** Many people believe a necropsy begins when you start using the knife. But if you neglect to look at many external aspects of the carcass, some key findings can be missed.

Figure 16. Examine the site where the animal was found for clues: predators (dogs), lightning, poisons and poisonous plants, signs of trauma.

- Evaluate the general body nutritional and hydration status.

- Look at the external orifices for any discharges and for color of mucous membranes. Look at teeth for age and abnormal wear.
- Are there any skin lesions or external parasites?

Sunken eyes are an Indication of dehydration.

Check the teeth to determine the age of the

Figure 17. Eternal examination

- Examine all mucous membranes - mouth, nares, conjunctiva, anus, vulva or prepuce - for any discoloration or other abnormalities.

3. Open the body

The next step in the necropsy is to expose the internal organs. Place the animal on its left side.

Figure 18. Open the body of animal

4. Remove the organs/tissue/fluid

Examination of the organs within the body is not very efficient. The following organs are removed and placed next to the carcass: respiratory tract with heart, tongue and

esophagus (“pluck”), rumen/abomasum/intestines, liver, urogenital tract, reproductive tract, brain.

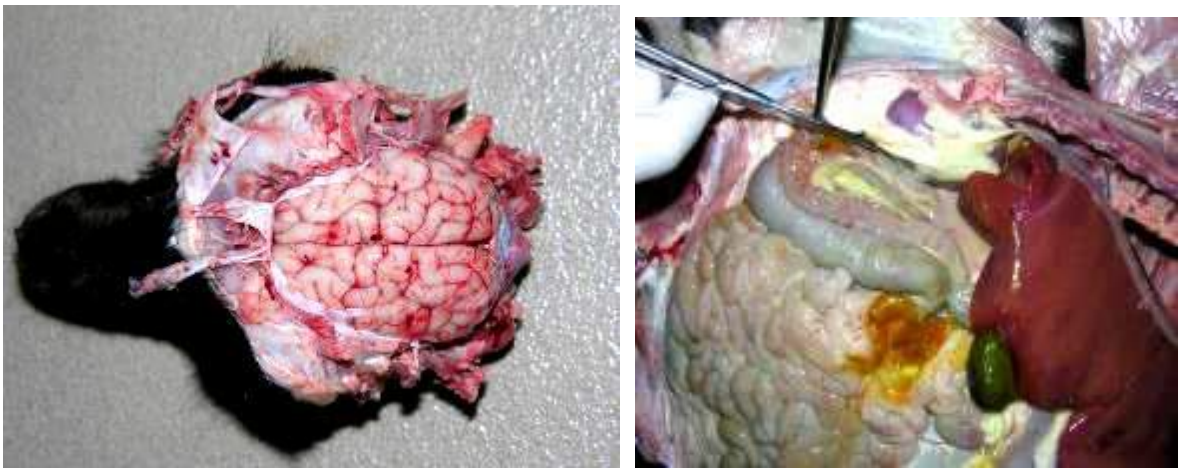

Figure 19. Removing organ from the body

5. Examine and sample the organs

In examining and sampling, we usually go from the **“cleanest”** to the **“dirtiest”.** Usually this order is: lymphoid tissue, brain, lungs, heart, kidneys, reproductive tract, liver, intestinal tract. Note any abnormalities for each (color, size, shape, consistency, exudates). Be sure to examine both capsular and cut surface. Make several cuts in each organ. Collect specimens for further diagnostic work.

4.4 Sampling of Tissues

Tissues should be collected in duplicate, with half going into **10% formalin** for histopathology and half as unfixed tissues that will be used for bacterial culture, virus isolation, fluorescent antibody testing, toxicology, etc. The following tissues should be collected in all cases: lung, liver, spleen, heart, brain, kidney, intestines. Additionally, any other tissue that might have lesions (skin, adrenal, ovary, etc.) should also be collected. Crushing should be avoided when taking samples since this may cause histological artifacts. This can be avoided by using a sharp blade and a hard surface.

Figure 20. Tissue sample collected from different organs

When examining any organ with a mucosal surface (trachea, esophagus, intestine, etc.) care should be taken not to damage or destroy the mucosal surface by rubbing the surface with fingers or instruments.

4.5 Sample collection at post-mortem

Samples of tissue from a variety of organs can be taken at post-mortem Animal health personnel should be trained in the correct procedures for post-mortem examination of the species of animals with which they work. The equipment required will depend on the size and species of animal, but a knife, saw and cleaver will be required, and also scalpel, forceps and scissors, including scissors with a rounded tip on one blade, for opening intestines. A plentiful supply of containers and tubes of transport media appropriate to the nature of the sample required should be available, along with labels and report forms. Containers should be fully labelled with the date, tissue and animal identification. Special media may be required for transport of samples from the field. The operator should wear protective clothing: overalls, washable apron, rubber gloves and rubber boots. Additionally, if potential zoonotic diseases are being investigated, the post-mortem examination should be conducted in a biological safety cabinet; if this is not possible, an efficient face mask and eye protection should be worn. If rabies or transmissible spongiform encephalopathies (TSEs) are suspected, it is usual to detach the animal's head.

- Tissues may be collected for
- Microbiological culture,
- Parasitology,
- Biochemistry,
- Histopathology and/or
- Immunohistochemistry, and
- For detection of proteins or genome nucleic acids.

In addition buccal, oropharyngeal or rectal (cloacal) swabs may be collected. The person conducting the post-mortem examination should have sufficient knowledge of anatomy and pathology to select the most promising organs and lesions for sampling. Each piece of tissue should be placed in a fully labelled separate plastic bag or sterile screw-capped jar. Swabs should always be submitted in appropriate transport media. Sterile instruments should be used for collecting specimens for microbiological culture and care should be taken not to contaminate tissues with intestinal contents. Disinfectants should not be used on or near tissues to be sampled for bacterial culture or virus isolation. The tissues may be sent to the laboratory dry or in bacterial or virus transport medium, depending on the type of specimen and the examinations required; swabs should be sent in transport medium. After collection, the samples for **microbiological examination** should be refrigerated until shipped. If shipment cannot be made within 48 hours, the samples should be frozen; however, prolonged storage at –20°C may be detrimental to virus isolation. For **histopathology,** blocks of tissue not more than **0.5 cm thick and 1–2 cm long** are cut and placed in neutral buffered 4–10% formalin, which should be at least ten times the volume of the tissue sample.

For certain suspected diseases, larger portions of brain are required; the brain is sectioned using a sagittal cut, half is submitted fresh, on ice, and the other half is submitted in 10% buffered formalin. For scrapie, bovine spongiform encephalopathy and other TSEs. Store and pack formalin-fixed tissues separately from fresh tissues, blood and smears. Care should be taken to insure that formalin-fixed tissues are not frozen. Once fixed, tissues can be removed from formalin and, as long as they are kept

moist and protected (e.g. by wrapping in formalin-soaked paper towels, then sealed in screw-capped jars), they can be forwarded to the laboratory without formalin.

Lymphoid system: The spleen should be relatively flat, not turgid, and will not fracture when folded. On cut surface, it should be uniform

Figure 21. Taking sample from the spleen

Lymph nodes should not bulge on cut surface and should have a uniform homogeneous, white-tan appearance. An exception is the mesenteric lymph nodes which usually have dark (brown-black) pigment at their centers. This is normal in ruminants.

Brain: Often the brain is sliced down the middle to create symmetrical halves for frozen and formalin specimens.

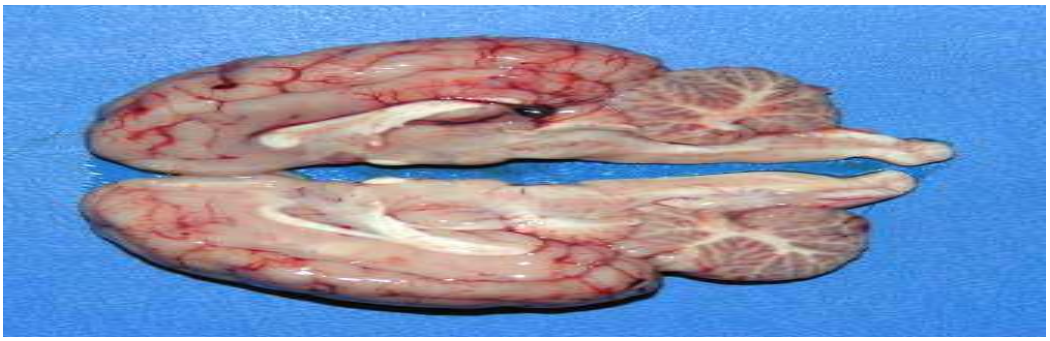

Figure 22. Brain tissue sampling

Heart: The heart can now be examined. Identify the heart within the pluck and gently open the pericardial sac to see the fluid within. Then remove the heart from its attachments to the rest of the pluck.

Figure 23. Heart tissue sampling

It is important to examine all chambers of the heart. This can be confusing. The best way is to open the left ventricle first. Use a knife to make a vertical cut from apex to base over the left ventricle, then use scissors or a knife to extend the cut up through the left atrium and into the aorta. This will allow to see both left chambers and both left valves on the left side (left a-v valve and aortic valve).

Respiratory system: Begin by cutting down the trachea and into the bronchi, making note of any mucus, froth, or petechial.

Figure 24. Incising Lung tissue

Palpate all lobes of the lung. Lungs should be uniformly pink and slightly spongy. Make several cuts through the lungs - be sure to look in all lobes.

Urinary tract: For each kidney, peel the capsule back. It should peel easily. Slice through the kidney to examine the cut surface.

Figure 25: Kidney inspection and sampling

Reproductive tract: At left is the female reproductive tract. Slice through the ovaries. Also cut into the uterine horns, uterine body, and cervix, observing mucosal surfaces. Cut into the testes to look at the parenchyma.

Figure 26. Inspecting reproductive system

Liver: The liver's surface should be examined for any abnormalities. It should be palpated for any nodules, friable areas, or other abnormal changes. Several slices are made into the liver in order to examine the deeper structure of the liver.

Figure 27. Inspecting and sampling liver tissue

Intestinal tract: Spread out the intestines and determine the various parts. Begin with the duodenum and follow down the jejunum, to the ileum, which empties into the cecum at the ileo-cecocolic junction. The large intestine slowly narrows to become the spiral colon, which then progresses on down to the terminal colon.

Figure 28. GIT inspection and sampling

Look at the mesenteric lymph nodes. Cut through several to see the cut surface.

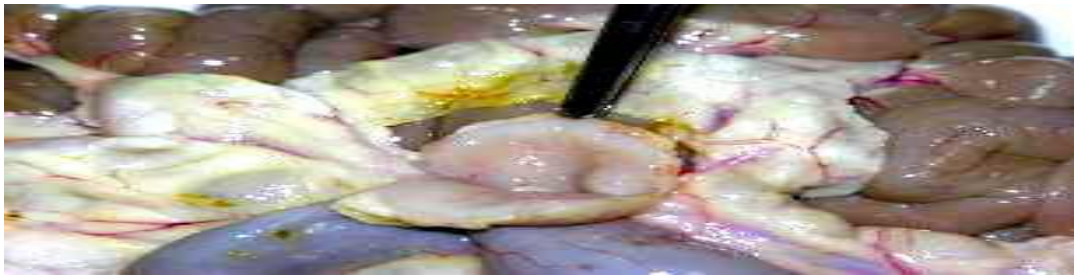

Figure 29. Inspecting and sampling mesenteric lymph node tissue

Open segments of the intestinal tract, beginning with the duodenum and working caudally. Be sure to examine the mucosal surface carefully and open numerous segments. If the history indicates an intestinal problem, you may need to open the entire intestinal tract. Because of the way you removed the tract, the abomasum is still attached to the forestomaches. Open the abomasum first. Remember this is the only glandular part of this mass. Look at the contents of the abomasum and examine the mucosal surface. You may need to run some water lightly over the mucosa to get a good view. Then open the reticulum and the omasum. Last will be the rumen itself. Remove some of the contents and look at the pillars and the papillae. Also note the consistency of the contents.

Self-Check 4 – Written Test

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

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

Test I. Write true if the statement is correct/False if it is incorrect for the following questions (4 point each).

1. Recognizing and recording abnormalities are enhanced by developing a consistent routine in the dissection and collection of tissues.
2. In examining and sampling, we usually go from the "cleanest" to the "dirtiest".
3. For histopathology, blocks of tissue not more than 0.6 cm thick and 3cm long are cut and sampled.

Test II. Choose the best answer for the following questions (4 point).

1. Tissues collected in duplicate, with half going into 10% formalin for histopathology and half as unfixed tissues that will be used for:
   A. Bacterial culture
   B. Virus isolation
   C. Fluorescent antibody testing,
   D. Toxicology E. All of the above
2. A good necropsy should pay attention to all of the consistent routine entails ecept:
   A. Histroy of the pateint
   B. Eternal examination
   C. Open the body
   D. Removing organs
   E. Examine and sample the organ

Note: Satisfactory rating – 11 points Unsatisfactory - below 11 points

You can ask your teacher for the copy of correct answers

5.1 Inspection of heads

- **A head:** which has been skinned and washed clean is ready for inspection after the base of the tongue has been detached so as to give access to the masticatory muscles and lymph nodes. Where head loops are used the lymph nodes may be incised and examined before the tongue is dropped.
- **The head including** the oral and nasal cavities should be viewed. The sub-maxillary (lymphonodi mandibulares), parotid (lymphonodi parotid) and retropharyngeal lymph nodes (lymphonodi retropharingei) should then be examined by viewing and multiple incisions. The tonsils should be removed after inspection. The muscles of mastication should be viewed and incised. One or more linear incisions should be made parallel to the lower jaw into the external and internal muscles of mastication. The tongue should be viewed and palpated and, if necessary, an incision should be made into the root of the tongue without mutilation of the blade. The lips and gums should be viewed.

5.2 Inspection of viscera

The following viscera should be examined:

- **Gastro-intestinal tract:** viewing of stomachs and intestines and if necessary palpation. Viewing and if necessary palpation and incision of the mesenteric **lymph nodes** (lymphonodi mesenteric), provided they are not obviously diseased. The esophagus should be separated from its attachment to the trachea and viewed.
- **Spleen:** viewing of organ, palpation, and if necessary, incision. Whenever required a smear of the spleen pulp should be taken.
- **Liver:** Viewing and palpation of entire organ. The portal lymph nodes (lymphonodi hepatic (portals)) should be incised provided they are not obviously diseased. The large bile duct should be opened up by an incision of at least 3 cm

in length. Where necessary for reaching a 'diagnosis one or more incisions should be made deep enough to open up bile ducts and liver substance. The gall bladder should be viewed and, if necessary, palpated.

- **Lungs:** viewing and palpation of the entire organ, viewing and incision of bronchial and mediastinal lymph nodes (lymphonodi tracheobronchial mediastinal), provided they are not obviously diseased. If necessary an incision should open up the larynx, trachea and bronchi. A transverse incision across the lower part of the diaphragmatic lobe should open up the bronchi,
- **Heart:** viewing of the heart after the pericardium has been opened. One or more incisions should be made from base to apex or alternatively the heart may be everted and shallow incisions made so that the cardiac valves and muscle tissue can be inspected.
- **Uterus:** viewing, palpation and, if necessary, incision.*)
- **Udder:** viewing of the udder, palpation and, if necessary, incision. When the udder has been or is in. lactating state, incision) of the supra-mammary lymph nodes (lymphonodi inguinal superficial) should be a routine procedure. If the udder is destined for human consumption, incision of the organ itself should be a routine procedure.
- **Kidneys:** enucleation,' viewing and, if necessary, palpation and incision.
- **Testicles:** (where they are saved for human consumption): viewing and palpation. If incisions are made, every precaution should be taken to prevent contamination of the premises, equipment and personnel.

5.3 Inspection of carcasses

- The carcass should be examined to ascertain:
  - ✓ Condition;
  - ✓ 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).
- In all animals reacting to the tuberculin test and in those carcasses and viscera in which tubercular lesions are found, the main carcass lymph nodes should be examined. A similar procedure should be carried out in all cases in which a systemic or generalized disease is suspected to exist.

In general inspection of meat is a value chain approach

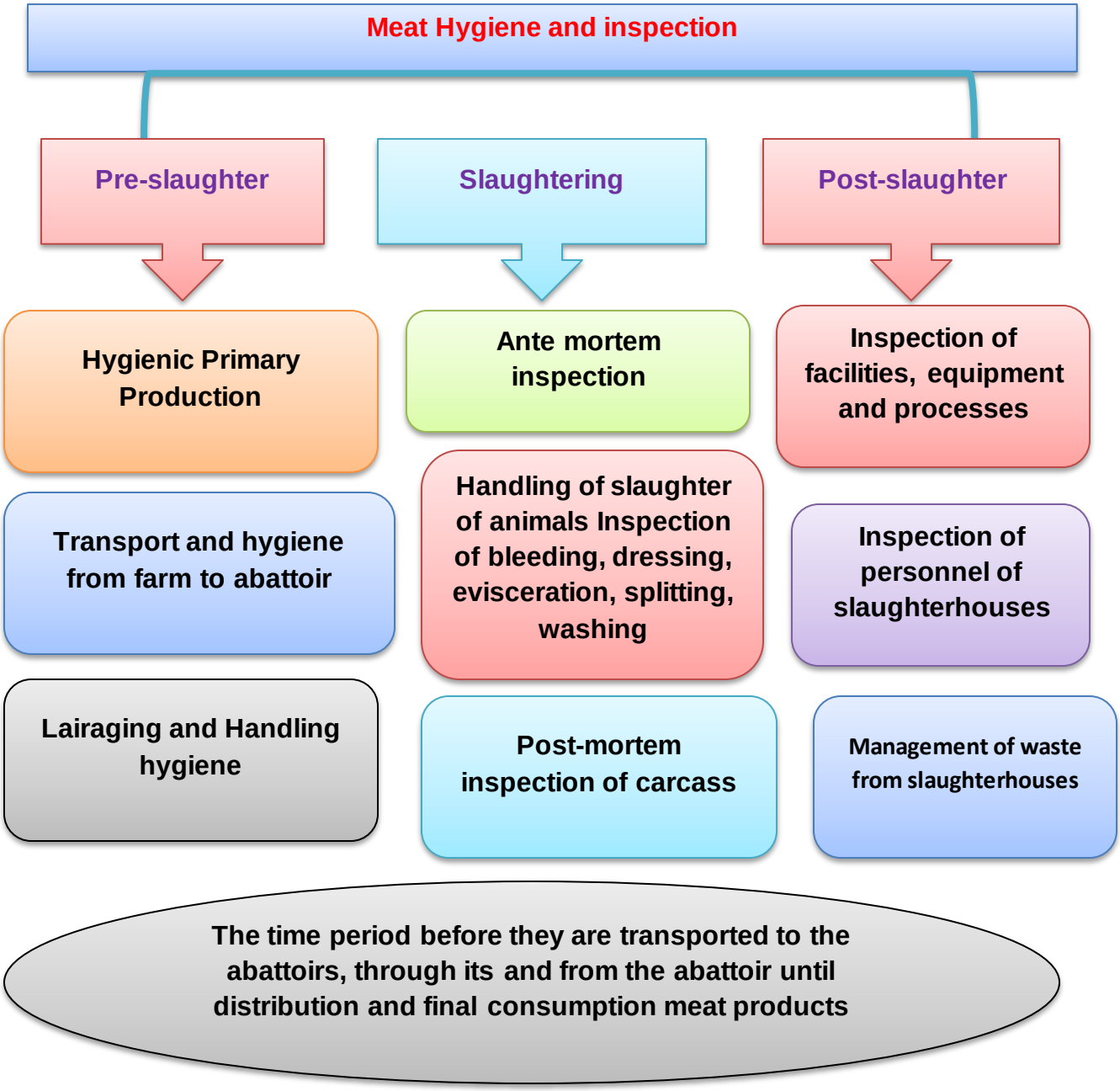

Figure 30. The general inspection process of meat

Self-Check 5 – Written Test

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

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

Test I. Write true if the statement is correct/False if it is incorrect for the following questions (4 point each).

1. In all animals, in which their carcasses and viscera had tubercular lesions, the main carcass lymph nodes should be examined.
2. During eamining carcass, if necessary, triceps brachial muscle, should be incised.

Test II. Choose the best answer for the following questions (4 point).

1. The post mortem carcass examination should be to ascertain:
   A. Condition;
   B. Efficiency of bleeding;
   C. Colour;
   D. Condition of serous membranes
   E. All of the above

Test III. Short Answer Questions (10 point)

1. Describe and discuss post mortem inspection of bovine animals.

Note: Satisfactory rating - 11 points **Unsatisfactory - below 11 points**

You can ask your teacher for the copy of correct answers

Information Sheet 6- Disposing unfit offal and waste products

6.1 Introduction

All dead animal cadavers and condemned meat should be disposed carefully under the custody of the meat inspector until properly disposed. However condemned organs and carcasses can be directed to the by-product processing plant in bigger abattoirs. Rendering of raw animal waste involves a series of drying and separating processes by which the material is sterilized and the fats and proteins are extracted to produce tallow and meat-and-bone meal. At the start of the process, the waste material has a water content of up to 70%; its removal involves relatively high-energy costs. The water effluent produced also needs to be treated to avoid pollution. The organic nature of the material creates further problems of odour pollution, requiring additional pollution abatement technology.

Technical alternatives to rendering

Only small amounts of animal waste are currently disposed of to **landfill** because only a few sites are licensed to take it and because abattoir waste is legally required to be adequately sterilized before disposal to landfill.

Incineration appears to be more suitable for dealing with whole carcasses than for waste offal, which has high water content and a low calorific value. The costs of incineration are also relatively high.

Anaerobic digestion is a process whereby organic material such as animal waste is broken down or degraded by micro-organisms operating in an oxygen-free environment. The capital and other costs of anaerobic digestion are more uncertain than for other forms of waste treatment and disposal and the technology is still in the process of development. Developments in this area show considerable promise as both a low-cost and low-pollution means of dealing with raw animal and other waste, although these newer technologies have yet to be fully tested and commercially proven.

Manure, paunch and viscera contents

These must be disposed of in a manner which will not create a sanitary problem on the premises of the registered slaughter establishment. Storage of such wastes in the vicinity of the registered establishment is unacceptable.

6.2 Manure, Compost and Biogas

Digestive and excretory wastes of ruminants, collectively referred to as manure are a mixture of dung and urine and occur in two forms:

- As sweepings from liairages which are built into heaps outside the slaughter building and occasionally collected in small quantities by small-scale farmers to enrich soil fertility.
- And secondly as kraal manure which may remain permanent on the holding ground. Kraal manure is less preferred because it is often sodden with water (from rains) or mixed with earth from treading by the animals as well as straw from bedding, thus creating problems in collection and spreading on farms.

Self-Check 6 – Written Test

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

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

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

1. All dead animal cadavers and condemned meat should be disposed carefully under the custody of the meat inspector until properly disposed

Test II. Choose the best answer for the following questions (3 point).

1. _____is a process whereby organic material such as animal waste is broken down or degraded by micro-organisms operating in an oxygen-free environment.
   A. Incineration
   B. Landfill
   C. Anaerobic digestion
   D. All of the above

Test III. Short Answer Questions (10 point)

1. Describe and discuss methods of condemned and unfit offal.

Note: Satisfactory rating -7. 5 points Unsatisfactory – below7. 5 points

You can ask your teacher for the copy of correct answers

Operation Sheet: 1. Dissection/Splitting carcass

Procedure: Dissection of carcass

Objective: Conducting Splitting of carcass

Materials: (Hook, record book, pen, Carcass splitting machine, carcass, carcass storage room)

Procedure:

Step 1. Wear and use personal protective equipment.

Step 2. Check availability of meat carcass for splitting.

Step 3. Assemble tools and equipment needed for splitting.

Step 4. Check availability of storage area for split carcass with relevant people.

Step 5. Make sure the carcass is in the most effective position for splitting.

Step 6. Place yourself in the most effective place and position for splitting.

Step 7. Carry out splitting of meat carcass.

Step 8. Carry out splitting at a pace to meet the speed of production.

Step 9. Clean and maintain tools and equipment between tasks .

Step 10. Inform relevant people if problems occur outside the limits of your responsibility.

Operation Sheet: 2. Procedure of Post mortem Inspection

Procedure for Post mortem inspection of

Objective: Conducting post mortem inspection

Materials: (Record book, pen, carcass, offal, knife, glove, water, table inspection room)

Procedure:

Post-mortem inspection procedure

Step 1. Routine post-mortem inspection should include viewing, palpation and, where necessary, incision. This inspection should be carried out in a hygienic and systematic manner.

Step 2. Where a lymph node, organ or any carcass tissue is being incised by the inspector, the cut surface should be cleanly sliced in order to present a picture which is not distorted.

Step 3. The head, organs, viscera and any other part of a carcass required for post-mortem inspection should be identifiable with the carcass from which they were removed until inspection has been completed.

Step 4. Except with the permission of the inspector no person should, prior to the inspection of any carcass being completed:

- Remove any serous membrane or any other part from the carcass; or
- Remove, modify, or obliterate any evidence of disease in the carcass or organ by washing, scraping, trimming
- Remove any mark or identification from the carcass, head or viscera until the inspector has completed his inspection and given his decision.

Step 5. No person should remove from the inspection area of an abattoir any part of any carcass, organ, or any viscera, until the inspector has completed his examination and a decision has been given.

Step 6. Viscera should be examined: As they are removed from the carcass

Operation Sheet: 3. Procedure of post mortem sample taking

Purpose Post mortem sampling of tissue/organ/fluid

Objective: Conducting post mortem sample collection

Materials: (glove, sampling bottle, tray, knife, gown, scalpel, scalpel blade, animal)

Procedure:

Step 1: Obtain history of animal

Step 2: Examine the carcass/body of the animal

Step 3: Open the body/cavity of the animal

Step 4: Remove the organ from the body

Step 5: Examine and take the appropriate sample from the organ

LAP TEST

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

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

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 2 hour. The project is expected from each student to do it.

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

Lap Test Title 1: Procedure of carcass splitting

Lap Test Title 2: Procedure of post mortem inspection

Lap Test Title 3: Procedure of post mortem sample collection

Reporting an animal escape

Task1. Carry out splitting of meat carcass

Task 2. Perform post mortem inspection

Task 3. Perform post mortem sample collection

LG 63	LO 4. Complete the Post-mortem Examination

Instruction sheet

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

- Passing judgment for consumption on carcass based on ante mortem and post mortem examination results
- Labelling and taking whole or part of carcass with suspicious signs
- Labelling and packaging samples sent for analysis
- Collecting information of examined animal with the records of observations during the post-mortem
- Cleaning, disinfecting and storing equipment used in post mortem area hygienically
- Completing personal biosecurity clean-up

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:

- Pass judgment for consumption on carcass based on ante mortem and post mortem examination results
- Label and take whole or part of carcass with suspicious signs
- Label and package samples sent for analysis
- Collect information of examined animal with the records of observations during the post-mortem
- Clean, disinfect and store equipment used in post mortem area hygienically
- Complete personal biosecurity clean-up

Learning Instructions:

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

Information Sheet 1- Passing judgment for consumption on carcass based on ante mortem and post mortem examination results

1.1 Introduction

Classifying the lesions into one of two major categories - acute or chronic.

- Establishing whether the condition is localized or generalized, and the extent of systemic changes in other organs or tissues.
- Determining the significance of primary and systemic pathological lesions and their relevance to major organs and systems, particularly the liver, kidneys, heart, spleen and lymphatic system.
- Coordinating all the components of ante mortem and postmortem findings to make a final diagnosis.
- Submitting the samples to the laboratory for diagnostic support, if abattoir has holding and refrigeration facilities for carcasses under detention.

Carcass judgment

Some of the signs of a generalized disease are:

- Generalized inflammation of lymph nodes including the lymph nodes of the head, viscera and/or the lymph nodes of the carcass
- Inflammation of joints
- Lesions in different organs including liver, spleen kidneys and heart
- The presence of multiple abscesses in different portions of the carcass including the spine of ruminants
- Generalized lesions usually require more severe judgment than localized lesions.

1.2 Decisions at post-mortem inspection:

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 has not 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: if 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 required.

Self-Check 1 – Written Test

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

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

Test I. Write true if the statement is correct/False if it is incorrect for the following questions (4 point each).

1. Inspector should be coordinating all the components of ante mortem and postmortem findings to make a final diagnosis.
2. Conditionally approved for human consumption is passed, if the carcass or organ poses hazards to the public or animal health and but the hazard can be eliminated through proper treatment.

Test II. Choose the best answer for the following questions (4 point).

1. If the slaughter operation has been performed in hygienic manner and no disease or abnormalities as well as drug residues does not detected at post mortem inspection, what was the final judgement should be passed by the inspector regarding the carcass and offals?
   A. Totally condemned
   B. Approved for human consumption
   C. Conditionally approved for human consumption
   D. Approved for human consumption with distribution restricted to limed areas

Test III. Short Answer Questions (8 point)

1. What was the reason behined on the dettection of meat for the reasonable period of time? Explain it.

Note: Satisfactory rating – 10 points **Unsatisfactory - below 10 points**

You can ask your teacher for the copy of correct answers

Information Sheet 2- Labelling and taking whole or part of carcass with suspicious signs

2.1 Introduction

Samples shall be taken from processing, storage areas, equipment and meat used in food production or at point of production or sale, when such sampling is necessary for ensuring that the criteria are met.

2.2 Information to be sent with samples

It is essential that individual samples be clearly identified using appropriate methods. Marking instruments should be able to withstand the condition of use, i.e. being wet or frozen (use indelible marking pen). Pencil has a tendency to rub off containers and labels attached to plastic will fall off when stored at –70°C. Information and case history should always accompany the samples to the laboratory, and should be placed in a plastic envelope on the outside of the shipping container. As outlined in the following section on transport of samples, this information must also be inside the shipping container. The following are suggested items that should be addressed. It would be advisable to contact the receiving laboratory to determine if it has a submission form that it would like to have submitted with the samples or if it needs other information.

1) Name and address of owner/occupier and geolocation (latitude and longitude, if available) where disease occurred, with telephone and fax numbers.
2) Name, postal and e-mail address, telephone and fax numbers of the sender.
3) Diseases suspected and tests requested.
4) The species, breed, sex, age and identity of the animals sampled.
5) Date samples were collected and submitted.
6) List of samples submitted with transport media used.
7) A complete history would be beneficial for the laboratory and should be included if possible. Some of the components of the history are:
    - A list and description of the animals examined and the findings of the post-mortem examination.

- The length of time sick animals have been on the farm; if they are recent arrivals, from where did they originate.
- The date of the first cases and of subsequent cases or losses, with any appropriate previous submission reference numbers.
- A description of the spread of infection in the herd or flock.
- Collection and shipment of diagnostic specimens

Self-Check 2 – Written Test

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

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

Test I. Write true if the statement is correct/False if it is incorrect for the following questions (4 point each).

1. Samples shall be taken from processing, storage areas, equipment and meat used in food production.
2. Information and case history should always accompany the samples to the laboratory, and should be placed in a plastic envelope on the outside of the shipping container.

Test III. Short Answer Questions (6 point)

1. What are the information should be incorporated with the sample while sending to the referal laboratories?

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

You can ask your teacher for the copy of correct answers

Information Sheet 3- Labelling and packaging samples sent for analysis

3.1 Introduction

Enclose specimens in a secure container and label the container with a waterproof pen. Place this container in a waterproof bag with tissue, towels or other blotting material to absorb any leakage. Put all specimen containers in an insulated box packed with ice or frozen refrigerant packs and deliver them to the laboratory as soon as possible. If sending specimens by post or courier ensure that they are delivered during business hours on a weekday.

3.2 Packaging and labelling

Packaging: Packaging of fresh, chilled and frozen products shall be done in food grade packaging materials that protect the meat product from any physical, microbiological, chemical or any other type of contamination during storage, distribution and handling.

Labelling: Labels and marking on the packaging are an essential source of information to communicate to everyone involved in the transportation process the contents of the package, the nature of the hazard and the applied packaging standards. Most “certified” shipping containers already include the appropriate labels and markings as part of the package. All markings must be placed on the packaging so that they are not covered or obscured by any part of, or attachment to the packaging, or any other labels or markings. All markings must be:

- Durable and printed or otherwise marked on, or affixed to, the external surface of the packaging
- Readily visible and legible
- Able to withstand open weather exposure without substantial reduction in effectiveness;
- Displayed on a background of contrasting colors

Address the sample clearly with labelling including the following information:

- The name and telephone number of the receiving laboratory.
- Name/initials of researcher
- Date sample prepared
- Sample identification such as:
  - ✓ Identification number
  - ✓ Sample name
  - ✓ Species name
- Location where sample was collected (coordinates, address, etc.)
- Variables that may affect sample, such as: air temperature, altitude, water depth, humidity, etc. during collection
- Time of collection
- Type of sample the name of the organisation or individual conducting the research, or making the collection;
- The name of the abattoir of origin;
- The kind and amount of sample removed;
- The purpose of collection; and
- How the material must be disposed of after the intended use, where applicable.
- The approval of the owner of the plant is required for the arrangements for the collection of specimens.

Properly Label Samples

- Reduces risk of contamination
- Reduces injury to self and others
- Maintains clean and organized working environment
- Avoids loss or damage to valuable samples
- Maintains integrity of research being conducted

Raw meat or poultry: Use one of the following methods:

- Using a sterile utensil or sterile glove, place carcass or large piece of meat in a large sterile plastic bag.
- Add 100–300 ml enrichment broth.
- Remove sample and seal the bag.
- Wipe a sterile sponge over a large section of the carcass or piece of meat.
- Place swab in a jar containing enrichment broth.
- Moisten a swab in buffered distilled water or 0.1% peptone water.
- Wipe the swab over a large section of the carcass or piece of meat.
- Place swab in enrichment broth.
- Using a sterile glove wipe the carcass or the piece of meat with sterile gauze pads and place the pads in a jar containing enrichment broth.
- Aseptically cut a piece of meat or skin from different parts of the carcass or large piece of meat, or remove part of the carcass. Place at least 200 g of sample in a sterile plastic bag or glass jar; refrigerate.

Self-Check 3 – Written Test

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

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

Test I. Write true if the statement is correct/False if it is incorrect for the following questions (4 point each).

1. Enclose specimens in a secure container and label the container with a waterproof pen is essential.
2. Packaging should be durable and printed or otherwise marked on, to, the external surface of the packaging.
3. Labels and marking on the packaging are an essential source of information to communicate to everyone.

Test II. Choose the best answer for the following questions (4 point).

1. Which one of the following is not the advantage of proper labbelling?
   A. Reduces risk of contamination
   B. Reduces injury to self and others
   C. Maintains clean and organized working environment
   D. Avoids loss or damage to valuable samples
   E. None of the above

Test III. Short Answer Questions (10 point)

1. Describe all essential information accompany packaging marking.

Note: Satisfactory rating - 13 points **Unsatisfactory - below 13 points**

You can ask your teacher for the copy of correct answers

Information Sheet 4- Collecting information of examined animal with the records of observations during the post-mortem

4.1 Introduction

Meat traceability is ability to follow the movement of a meat product through specified stage(s) of animal production, slaughter, processing and distribution of meat products. An extensive form of traceability is the ability to follow meat products forward from their source animal (at birth) through growth, slaughter, processing and distribution to the point of sale or consumption, (or backward from the consumer to the source animal). Animal identification is one component of meat traceability. Inspection personnel must also record information about the number of animals or birds slaughtered, the number and types of products condemned, and other details.

4.2 Information should be recorded on the record sheet during examination

The food/meat inspector is to complete the appropriate sections of the lot tally Sheet including the:

- Abattoir name and address
- Telephone Number
- Inspection date
- Shift of inspection
- Establishment number
- Specific production (lot number)
- Class of slaughtered animals
- Condemned part/whole carcass
- Condemnation reason
- Number of condemnations for each category
- Type of organ condemned and reason of condemnation
- Name, Date and signature of inspector

The food inspector gives the Lot Score Sheet to the "inspector's helper" at the beginning of each shift. The "inspector's helper" records the condemnations throughout the shift. Record the detail information and parameter on post-mortem inspection card

Table 5. 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---------- Date of post-mortem inspection----------
Signs observed for each organ and carcass---------- **Head region**---------- ---------- **Judgement**---------- ----------
Heart---------- ---------- **Judgement**---------- **Lung**---------- ---------- ----------**Judgement**---------- **Liver and Kidney**---------- ---------- ----------**Judgement**----------
Carcass---------- ---------- ----------**Judgement**----------
GIT organs inspection result---------- ----------**Judgement**----------
Name of Inspector---------- Signature ---------- Date----------

Self-Check 4 – Written Test

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

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

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

1. Meat traceability is ability to follow the movement of a meat product through specified stage(s) of animal production.
2. Animal identification is not one component of meat traceability

Test II. Choose the best answer for the following questions (5 point).

1. Which information should be recorded on the record sheet during post mortem examination
   A. Judgement of inspection
   B. Class of slaughtered animals
   C. Condemnetion reason
   D. Type of organ condemned and reason of condemnation
   E. All of the above

Test III. Short Answer Questions (10 point)

1. Prepare post mortem record format and conduct inspection of one animal at your local municipal abattoir.

Note: Satisfactory rating – 12.5 points **Unsatisfactory - below 12.5 points**

You can ask your teacher for the copy of correct answers

Information Sheet 5- Cleaning, disinfecting and storing equipment used in post mortem

5.1 Slaughterhouse cleaning operations

Dry-cleaning: It involves:-

- Collection of dropped waste scraps of meat, fat and pieces of bones
- Removal of thick deposit on equipment, floor and walls.
- Use of squeezers to remove blood from the floor

Wet cleaning (washing): It involves brushing and scraping using clean potable water. Plain water without detergent is used. The cleaning starts from higher parts of the building, rails walls and tables, equipments and later the floor. The floor itself is washed last. Sufficient and efficient brushes, brooms, hoses, rubber squeezers, buckets, and plain potable water should be provided. Warm water at less than 100^{O} F (41^{O}C) should be used in order to soften residues. Hot water or stream will cause blood residue to hold firmly.

Application of detergent solution: Detergents are defined as cleansing agents, solvents, or any substances that will remove foreign or soiling materials from surfaces. Detergents are used to dissolve proteins and oil that can reside on equipments or surfaces after use. Detergents lower surface tension and lift dirt or oil away from the equipment or surface. Specific detergents commonly used are hot water, soap, soap powders and cleansers. The detergent solution should be made up to the recommended concentrations and applied to the surfaces being cleaned. It is not advisable to sprinkle neat detergents on surfaces to be cleaned. Detergents must not affect the colour, taste or odour of meat. Efficiency of the detergents usually increases with temperature up to 140^{O}F (60^{O}C). This process of cleaning removes fat, grease and film of dirt from the surface.

The three basic phases of detergent action and use are penetration, suspension and rinsing. The following are the actions and agents required for each phase.

Penetration. The cleaning agent must penetrate between the particles of soil and between the layers of the soil and surface to which it adheres. This action, known as

wetting, reduces surface tension and makes penetration possible. Agents are: hot water, soaps and synthetic detergents, which are rather fragile suds formers.

Suspension. An agent is required to hold the loosened soil in the washing solution so it can be flushed away and not re-deposited. For fat particles, an emulsifying action is required to saponify the fat and carry it away. Soap, highly alkaline salts, and non-ionic synthetics may be used. For protein particles, colloidal solutions must be formed by peptizing (known also as sequestering or deflocculating). This action prevents curd formation in hard water.

Rinsing. The agent used must remove and flush away soils and cleaners so they are not redeposited on the surfaces being washed. Clean, clear hot water is usually effective alone. The walls, equipment and floor should be rinsed well with cold or more potable water to remove the detergent before application of a suitable disinfectant.

Disinfection. This is the process of destroying pathogens on slaughterhouse equipments, containers and working surfaces to make them safe for intended use. Disinfection is achieved by use of disinfectants. Disinfectant is chemical agent that destroys most pathogens but may not kill bacterial spores. Disinfectants are chemicals used to destroy microorganism of equipment used. Most disinfectants do not kill all microorganisms that are present on equipment and working surfaces, but will reduce their numbers to a level that is that is not harmful to human health. Sodium hypochlorite is the commonly used disinfectant in food industries. Some bacteria may develop increased resistance after prolonged contact with some disinfectants. As a result disinfectants should be changed after every 3-4 months.

Antiseptics. These are chemicals used to kill microorganisms on the skin as in hands of slaughterhouse workers.

Sterilization. This is the process of removing or destroying all forms of microbial life including bacterial spores using physical or chemical means. Sterilization is accomplished commonly by steam under pressure, by dry heat and by chemical sterilants. The choice of the method for sterilization depends on a number of factors including:

- The type of material that the object to be sterilized is made of,

- The number and type of microorganisms involved, and
- A availability of sterilization methods.

In many food industries, sterilization of equipments, meat containers and working surfaces is achieved by steam under pressure, or use of hot water at 90oC. All surfaces and equipment should be rinsed off with potable water before starting work where chemicals had been applied and let overnight.

Slaughterhouse cleaning involves dry and wet cleaning operations.

Figure 31. Clean slaughterhouse after operation.

5.2 Equipment cleaning and storing

All abattoir equipment should be cleaned properly and stored to their proper soring area. Water and detergents used to wash and clean the materials and equipment in the abattoir should be available all the time. Ample supply of good, hygienic, soft and hot water at a temperature of not less than 82° C and adequate number of hose points are essential. The usual method of applying hot water in meat plant is through high-pressure jet cleaners with 14kg f/cm2. The manual operation of spray guns in which the pressure is in the 35-49 kg f/cm2 range, the volume of water being low, averaging about 9 liters/minute.

Application of detergent followed by sanitizer or a combination of both is necessary for an actual meat premises under adequate pressure and temperature (not less than 14 kg f/cm2 and 82°C). Dry cleaning should commence immediately after operations have ceased and should embrace the whole premises, where disinfectant should be used.

This good system will ensure the final daily operation after the completion of slaughtering rendered more effectively. Cleansing operations must be done frequently to prohibit any built-up of bacteria on trolleys, hooks, gambrels, etc., which come in contact with the meat. Instead of using highly sophisticated cleansing installations, manual cleansing has been found to be more effective in some parts of the slaughterhouse.

5.3 Compound cleaning

- Cutting of grass, clearing of bushes and filling of potholes
- Collection of papers, old ropes, cans, horn and tail switches and burning them
- Regular collection of manure from shed and subsequent cleaning
- Proper disposal of condemned materials in lockable disposal pits
- Proper washing and disinfection of the lairage and races,
- Pave the external surface of the slaughterhouse, including drive way and vehicle washing stands
- Top part of the condemnation pit and blood tank, grease trap and drains
- Meat containers/carriers
- Control of birds, insects, rodents cats and dogs
- Proper liquid waste disposal
- Lairages, race, drains, loading bay, offices and wash rooms, top part of the grease trap, condemnation pit, blood tank, and manure shed; should be washed on daily basis and disinfected.

Self-Check 5 – Written Test

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

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

Test I. Write true if the statement is correct/False if it is incorrect for the following questions (6 point each).

1. Disinfectant is chemical agent that destroys most pathogens but may not kill bacterial spores
2. Antiseptics.are chemicals used to kill microorganisms on the skin as in hands of slaughterhouse workers.

Test II. Choose the best answer for the following questions (5 point each).

1. Dry-cleaning involves:-
   A. Collection of dropped waste scraps of meat, fat and pieces of bones
   B. Removal of thick deposit on equipment, floor and walls.
   C. Use of squeezers to remove blood from the floor
   D. All of the above
2. _____is the process of removing or destroying all forms of microbial life including bacterial spores using physical or chemical means.
   A. Disinfection
   B. Sterilization
   C. Sanitation
   D. Hygiene

Test III. Short Answer Questions (10 point)

1. What is the advantage of hygienic production of meat?

Note: Satisfactory rating – 16 points **Unsatisfactory - below 16 points**

You can ask your teacher for the copy of correct answers

Information Sheet 6- Completing personal biosecurity clean-up

6.1 Introduction

Biosecurity refers to "Security (prevention) from transmission of infectious diseases, parasites and pests from one animal to another". Maintaining healthy flocks requires effective biosecurity. Biosecurity is the effective use of hygiene procedures aimed at preventing the adverse effects of disease on performance. It can be defined as: a set of management practices which, when followed, collectively reduce the potential for the introduction or spread of disease causing organisms onto and between sites.

Slaughterhouse staff refers to anybody involved in all stages of slaughter, dressing, cleaning, inspection, loading and transportation of meat, washing and cleaning of equipment and all slaughterhouse premises. The attitude of the workers toward cleanliness is important as anything in the production of clean, wholesome, unspoiled products. Employee health and hygiene (clean hands, clothing and good hygienic practices) directly or indirectly, plays an important role in food safety and sanitation.

6.2 Legal requirements regarding the health and hygiene of workers

Medical fitness and records of employees

- Before employment at an abattoir or its cutting plant, medical certification must confirm that a person is –healthy and physically able to work as a meat handler; and is not a carrier of, or suffering from, a communicable disease e.g., tuberculosis, typhoid (salmonellosis) and other gastro-enteric diseases.
- All medical records pertaining to medical examinations and daily fitness checks must be available to the provincial executive officer or the registered inspector.
- Medical examination of personnel must be conducted at least once a year and must be repeated when clinically or epidemiologically indicated or as prescribed by the controlling authority.

Health checks: The hygiene manager must ensure that all personnel are examined daily, before starting work, for adverse health conditions. People who are suffering from a contagious disease or carriers of an infectious condition, or who have even been in contact with a source of contagion, may not work in any part of the abattoir where edible products are handled. This includes the slaughtering area, rough offal processing areas, storage facilities, cold storage, de-boning areas, offloading areas

Injuries: Workers who have injuries on the hands and lower portions of the arms such as cuts, abrasions, suppurating abscesses, sores, burns may not work with edible products unless such conditions treated immediately and secured with waterproof dressing or plastic glove or the injury is healed. Personnel must immediately report any injury to the inspectors.

Showering and washing of hands: People normally carry some bacteria on or in their bodies that can cause foodborne diseases. These are called "normal flora" and most people do not know they are there. For example, on the average, almost 2/3 of the populations are carriers of the bacteria that causes *Clostridium perfringens* food poisoning and one out of every three persons has Staphylococcus aureus in their nasal passages as normal flora. These important disease-causing microorganisms that are found on the body is sufficient to contaminate the hands, during a simple act of touching the nose or blowing the nose. Because hands are so important in the transmission of disease organisms, they must be properly washed and washed often.

Effective hand washing include, turn on warm water approximately 43°C to a simple tap which is foot- or knee-operated, apply liquid disinfectant soap and rub vigorously for at least 20 seconds, rinse with warm water, dry hands with paper towel, turn off water foot- or knee-operated or if hand operated use with paper towel.

Hygiene of protective clothing: All meat handlers and persons in a room handling meat should wear **CLEAN** protective clothing's (overcoat, cap, plastic apron, and gumboots). They should be of light color, preferably white and be clean and tidy. This does not necessarily apply to workers in liairages/receiving areas and dirty areas.

Self-Check 6 – Written Test

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

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

Test I. Write true if the statement is correct/False if it is incorrect for the following questions (4 point each).

1. Biosecurity refers to prevention from transmission of infectious diseases, parasites and pests from one animal to another.
2. The hygiene manager must ensure that all personnel are examined daily, before starting work, for adverse health conditions.
3. All meat handlers and persons in a room handling meat should wear clean protective clothing's.

Test II. Choose the best answer for the following questions (4 point).

1. Which one of the following is the component of biosecurity slaughtering house?
   A. Slaughtering house staff hygiene
   B. Coumpound hygiene
   C. Equipment and Personal protective equipment hygiene
   D. Showering, washing of area hygiene
   E. All of the above

Test III. Short Answer Questions (4 point)

1. Describe the importance of biosecurity maintainance.

Note: Satisfactory rating - 10 points **Unsatisfactory - below 10 points**

You can ask your teacher for the copy of correct answers

LG 64	LO 5. Develop Knowledge of Public Health

Instruction sheet

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

- Identifying pathological lesions and zoonotic diseases based on ante mortem and post mortem inspection
- Explaining effect of conducting slaughter in unhygienic area
- Assuring meat quality and hygiene maintenance
- Describing risk of consuming raw meat and meat products
- Undertaking disposal of part of carcass or organs found unfit

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 pathological lesions and zoonotic diseases based on ante mortem and post mortem inspection
- Explain effect of conducting slaughter in unhygienic area
- Assure meat quality and hygiene maintenance
- Describe risk of consuming raw meat and meat products
- Undertake disposal of part of carcass or organs found unfit

Learning Instructions:

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

5.1 Introduction

5.2. Poor condition /emaciation

Poor body condition/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.

Ante mortem findings:

- Wrinkled, dry leathery skin
- Rough hair coat
- Prominent bones and sunken eyes

Postmortem findings:

- Serious atrophy of fat in the carcass and organs especially the pericardial and renal fat
- The fat is watery. Translucent or jelly-like and hangs from the intervertebral spaces
- Edema and anemia may develop due to starvation and malnutrition due to parasite infestations.

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.

5.3 Imperfect bleeding

Incomplete bleeding can be caused by stress, ineffective stunning techniques (stun time to long or short, the stun to bleeding time to long) or an ineffective bleeding cut (throat cut or thoracic “sticking”). All the visible blood vessels may be blood filled causing the carcass to have an overall darker red colour. This is also true for organs such as the liver which may be dark purple-red in colour.

Judgement

Meat from such a carcass will have poor lasting qualities and is condemned.

5.4 Fevered (pyrexia) flesh

Fever is an abnormal elevated body temperature. It may be classified as septic and aseptic according to the presence or absence of an infection. In septic fever the infection is caused by viruses, bacteria, bacterial toxins, protozoa and fungi.

Ante mortem findings:

- Chills and sweating
- Dehydration
- Elevated body temperature
- Increased pulse and respiration
- Depression and dullness
- Anorexia and obstipation

In septic fever the other signs may include

- Diarrhea and vomiting
- Shock, convulsions and coma

Post mortem findings:

Rigor mortis

Putrefaction

Congestion of subcutaneous blood vessels and carcass

Enlarged lymph nodes

Evidence of cloudy swelling of liver, heart and kidneys

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.

Septicaemia

Ante mortem findings:

- Depression
- Changes in body temperature. The temperature is usually elevated but it can also be normal and subnormal during the terminal phases.
- Difficult and rapid breathing
- Shivering and muscle tremors

Congestion or Petechial hemorrhages of conjunctivae, mouth and vulvar mucosa

Post mortem findings:

- Enlarged edematous or hemorrhagic lymph nodes
- Degenerative changes in parenchymatous organs (liver, heart and kidneys)
- Splenomegaly
- Inadequately bled-out carcass as a result of high fever
- Blood stained serous exudates in abdominal and/or thoracic cavities.
- Anaemia resulting from bone marrow depression and icterus may also be present.

Judgment:

- The animals, animal carcasses, offal and other detached portions of animals affected with septicaemia are condemned.

5.5 Oedema or dropsy

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

Ante mortem findings:

- Depressed and drowsy
- Swelling of the mandible, dewlap, legs, shoulder, brisket and abdomen
- Edematous tissue is cool upon touch and is of a firm, doughy consistency.

Postmortem findings:

- Wet, sloppy musculature which pits on pressure
- Accumulation of clear yellow fluid in the thorax, abdomen and subcutaneous tissue

Judgment: Animals affected with generalized edema may be *condemned* on ante mortem 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.*

Figure 32. Abdominal edema caused by liver disease.

5.6 Pigmentation

Melanosis

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, 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.

Figure 33. Melanin deposits in the sheep viscera.

5.7 Jaundice/icterus

Icterus is the result of an abnormal accumulation of bile pigment, bilirubin, or haemoglobin in the blood. Yellow pigmentation is observed in the skin, internal organs, sclera (the white part of the eye), tendons, cartilage, arteries, joint surfaces etc.

Figure 34.Jaundice of an aged cow caused by liver disease. Note yellow discoloration of body fat, lungs, heart and kidneys.

Jaundice is divided into three main categories: Prehepatic jaundice (haemolytic icterus), Hepatic jaundice (toxic icterus), and Posthepatic jaundice (obstructive icterus).

Prehepatic or Hemolytic jaundice: occurs when there is an excessive break down of red blood cells before their actual life span by different hemoparasites, bacterial toxins, systemic infections, and in chemical and plant poisoning.

Hepatic or Obstructive jaundice: occurs when there is an obstruction to the passage of bilirubin from the liver to the intestine. The most common examples are gallstones or pressure from any kind of swelling and tumor in the surroundings of the bile ducts.

Hepato- cellular jaundice: is the result of extensive damage to the liver cells as a result of severe hepatitis.

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.

5.8 Calcification

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.

5.9 Gangrene: The death of body tissue (necrosis), generally in considerable mass, usually associated with loss of vascular supply and followed by bacterial invasion and putrefaction. It occurs most frequently in tissues susceptible to contamination, e.g. skin, lungs, intestine, vagina, uterus and those in penetrating wounds. Although it usually affects the extremities, gangrene sometimes may involve the internal organs. Signs are fever, pain, darkening of the skin, and an unpleasant odour of the affected site.

Two forms are known: dry and wet (gas). **Dry gangrene:** little to no blood supply to the area, lesions are dry, light brown in colour and have a leathery appearance. **Gas or wet:** Anaerobic spore forming bacteria (Clostridia) form gas. Lesions which are gas filled may also contain blood tinged serum. Putrefaction of necrotic tissue causes foul smelling colour is purple-green-brown to black colour.

Causes

- Mainly poor blood supply (hypoxia) – Freezing, snares etc.
  - ✓ Foreign body drawn into the lungs

- ✓ Torsion of organs
- ✓ Contaminated wounds

Judgement

Unless the gangrene is much localised and there is no evidence of toxaemia the carcass and offal is rejected.

5.9 Haemorrhage

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.

Figure 35. Fractured bone and muscle hemorrhage in a market hog.

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*.

5.10 Abnormal odour

Abnormal odours may result from the ingestion of certain feedstuff, drugs, various pathological conditions, absorption of odours from strong smelling substances and sexual odour from some male animals(like boars).

Judgment:

- The carcass having fish meal odour 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 odour in a carcass can have a limited distribution according to the consumers taste. Extremely strong sexual odour requires condemnation of the carcass.
- A carcass which gives off a pronounced odour of medicinal, chemical or other foreign substances shall be condemned. If the odour 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.

5.11 Abscesses (pyemia)

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

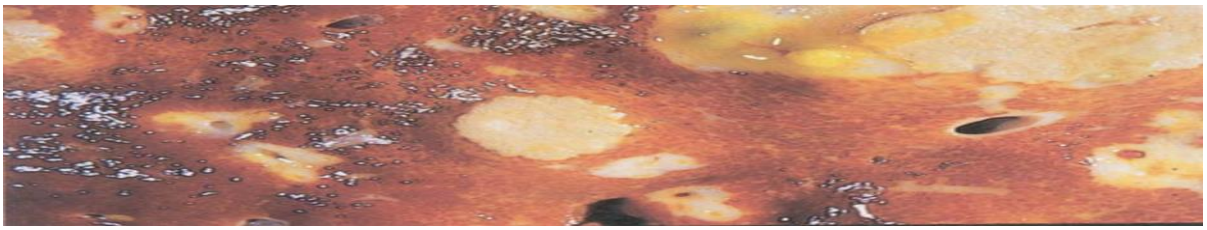

Figure 36.Liver abscesses caused by *Fusobacterium necrophorum*.

Judgment

The animals affected with abscesses spread through the blood stream (pyemia) are condemned on ante mortem 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 post mortem 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.

5.12 Bruise

Bruises are frequently found on ante mortem 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.

Figure 37.Extensive bruises of a beef carcass.

5.13 Immaturity

Immaturity occurs mainly in calves. The slaughter of calves younger than two weeks of age is prohibited.

- Ante mortem and post mortem findings:
- Presence of the umbilical cord
- Bluish and not completely retracted gums
- Grayish muscles are flabby, tear easily and are not well developed
- Dark red kidney and edematous kidney capsule

Judgment: Carcass and offal of immature animals are condemned

5.14 Major parasitic, bacterial, viral zoonotic diseases

Zoonotic diseases: - are diseases that are transmitted from animal to human beings

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). Taeniasis and Cysticercosis are common where beef meat is eaten raw or imperfectly cooked.

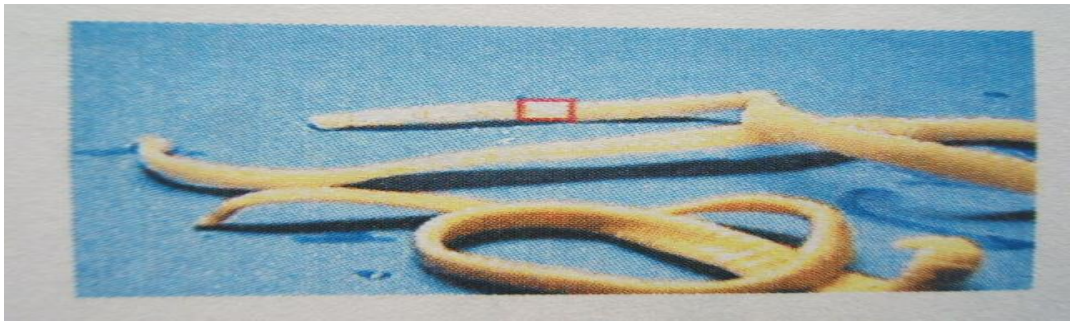

Figure 38.Taenia adult

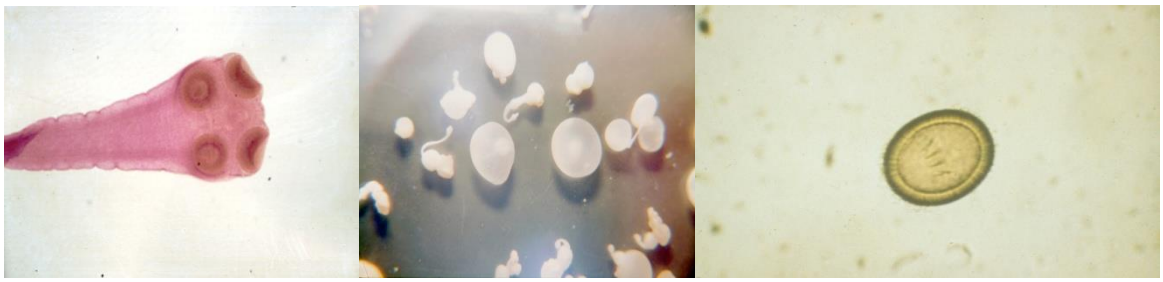

Figure 39. Adult, cyst and egg of Taenia respectively

Inspection procedures*:*

The routine inspection procedures for bovine Cysticercosis consist of visual examination of the following tissue of all bovine animals:

- Two incisions parallel to the jaw on the masseter muscles and one of the pterygoid muscles.
- Incisions of the heart septum

Incision of the ventral side of the tongue

- Incision in the triceps muscle

- Visual inspection of all exposed muscle surfaces.

Judgment*:*

- Slight or moderate infection: - warrants *conditional passing*. Parts of infected carcass and organs are unfit for human consumption.
- Generalized infection: - warrants *total condemnation*

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. The deep muscles of the thigh are often involved so that absence of infection of the usual sites does not necessarily indicate the absence of cysts in the carcass musculature. Cattle come into contact with tapeworm eggs while grazing in these pastures and consume them with the pasture. The eggs develop into larvae, which then penetrate the intestinal mucosa and are transported through the circulatory system and eventually lodge in their muscles where they occur as cysts. When man ingests cattle meat having cysts, larvae are liberated from the cyst which then develop into adult worms.

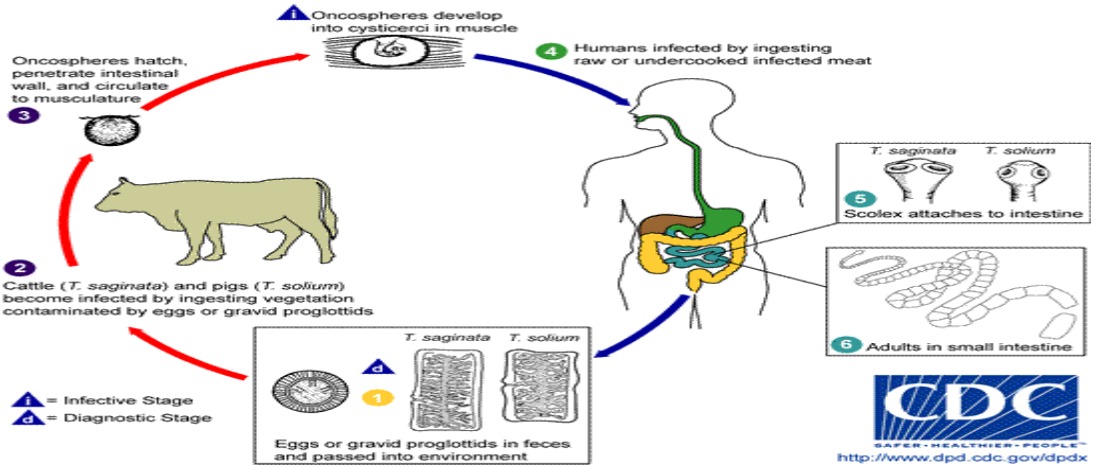

Figure 40. The lifecycle of Taenia saginata

Judgment:

- In countries where pork measles seldom occur it warrants total condemnation of the carcass and organs. Example, Ethiopia
- In countries where they occur frequently:
    - Slight infection: conditionally passed. The treatment should be by cold or heat as described in case of beef measles.
    - Generalized infection warrants total condemnation.

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
- Regular deworming of 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 adult worm is 0.5-2cm. long and consists of only three or four segments. The cystic stage is a hydatid cyst. 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. However, desiccation and high temperatures affect the longevity of the eggs. The intermediate hosts which include domestic herbivores and a wide range of herbivores acquire infection by ingesting infective eggs. In the stomach and small intestines enzymes act on the eggs to release onchospheres from embryophored eggs.

Figure 41. Hydatidosis in liver

The size of hydatid cysts in animals varies from that of a marble to a small football; they contain a clear watery fluid in which brood capsules may be floating around (so called hydatid sand). They are surrounded by a reactive connective tissue capsule. Sometimes the cyst degenerate becomes smaller with the fluid being replaced by caseous material, which may calcify.

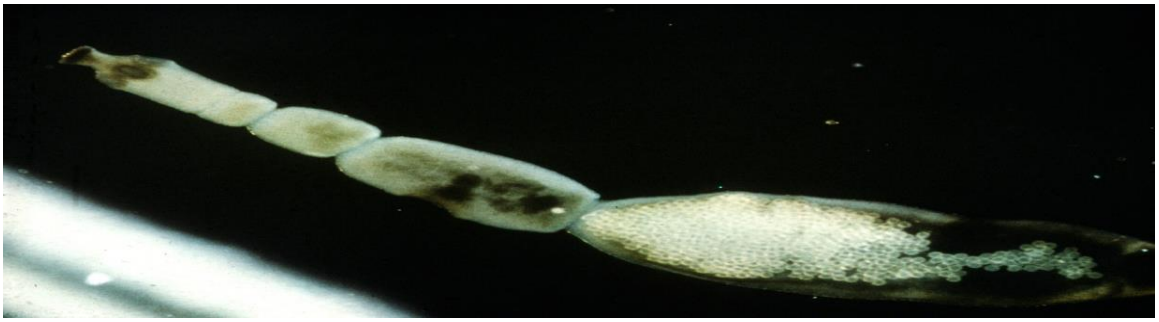

Figure 42. Echinococus granulosus

Hydatidosis in man is a serious and sometimes fatal disease. In order to break the life cycle of the parasite it is imperative that all organs or tissues containing cysts should be condemned and effectively destroyed.

Disease in Human. The clinical signs depend on the site and size of the cyst. Abdominal swelling due to presence of cysts in the lungs, liver or any abdominal organ, swelling of one or both eyes when the cysts affects the eyes

Figure 43. Echinococcosis/hydatid disease in humans

Judgment:

- Condemnation and destruction of affected organs
- Total condemnation if cysts are found in muscles or bones (very rare case)

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 in slaughterhouse and surroundings.
- Reduction of dog numbers by elimination of stray and surplus dogs

d) Trichinellaspirallis (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. The cysts measure about 0.5 by 0.25mm. Even though the cyst can remain alive for many years it tends to become calcified. Infection results from the consumption of raw or undercooked flesh of animals containing viable encysted larvae.

Judgment: as man may acquire the infection by eating infected pork

- The judgment is total condemnation.

e) Faschiolosis or liver fluke disease:

The disease is caused by a flattened, leaf-like, unsegmented, brownish-grey parasites affecting the bile duct and liver of cattle, sheep and goats.

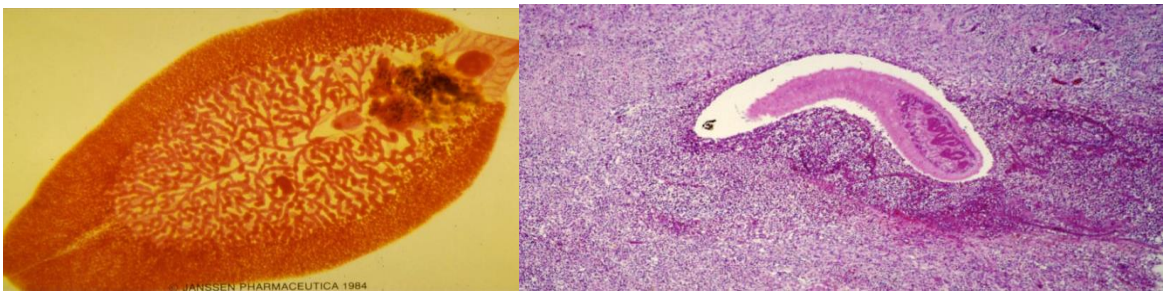

Figure 44. Faschiola hepatica Faschiola gigantic

Acute Faschiolosis:

- The liver is swollen, grayish-red in color and it is soft to the touch. Tracts filled with blood, dead liver tissue and immature flukes are found in the liver.

Chronic fascioliasis:

- Liver tissue is replaced by a fibrous connective tissue (cirrhosis) and in cattle by calcification of the bile ducts which contain thick brown bile and liver flukes. In sheep, however, no calcification of the bile ducts takes place.

Judgment:

- Acute fascioliasis: it must be condemned as fevered carcass.
- Chronic fascioliasis: markedly cirrhotic livers warrant total condemnation of the liver.

ii) Bacterial Zoonotic Diseases

a) Anthrax

This is an acute bacterial infection caused by *Bacillus anthracis* that occurs frequently in herbivorous 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.* The disease is typified by sudden death in domestic and wild animals. Terminally ill animals bleed from the nose, mouth, and bowel thus contaminating soil or watering place with the bacteria. The disease has a worldwide distribution. Human infection occurs as a result of contact with animals that have anthrax through:

1) Butchering and skinning
2) Consumption of contaminated meat
3) Contact with contaminated hides and skins, goats hair, wool or bones.

Ante mortem findings:

The peracute and acute forms in cattle and sheep are without clinical signs. Death may follow in the acute form after 1 – 2 hours of illness. The acute form lasts about 48 hours.

Postmortem findings:

- Dark-tarry blood discharge from body orifices
- Absence of rigor mortis
- Hemorrhage of the mucous and serous membranes, lymph nodes and subcutaneous tissue
- Enlarged spleen
- Severe hemorrhagic enteritis
- Degeneration of the liver and kidneys
- Bloating and rapid decomposition of carcass
- Localized lesions in the intestine of pigs (dysentery)

Diagnosis of anthrax is carried out by direct microscopic examination of tissues and fluids

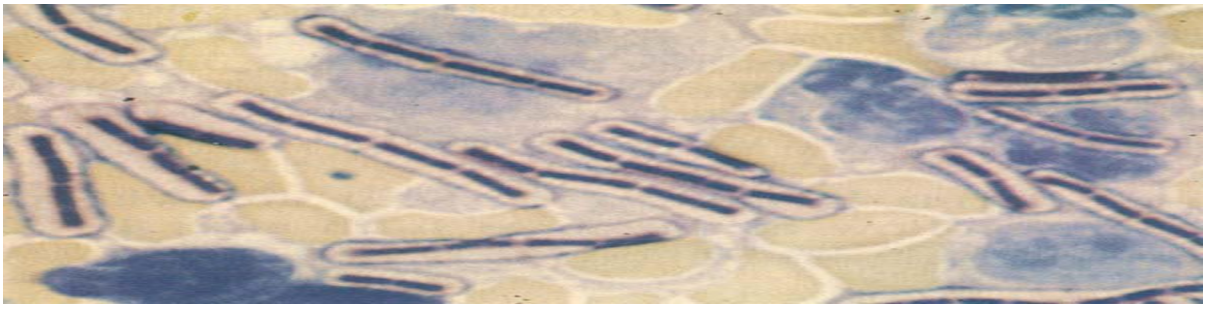

Figure 45. Bacillus anthracis.

Judgment: *Condemnation* of the carcass and its parts by burning or burial. If disposed by burial, the carcass should be buried at least 6 feet below ground.

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 anthacis
- 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. Four species of Brucella cause infection in man. These are: Br. melitensis (affecting mainly sheep and goats), Br. suis (affecting mainly pigs), Br. abortus (affecting mainly cattle), and Br. canis (which mainly affects dogs). Animals acquire the disease by sexual transmission or ingestion of contaminated feed. The disease causes abortion in cattle, sheep and pigs. Goats only develop lameness and mastitis. Brucella organisms are continuously shed in milk of lactating animals, uterine exudates, aborted fetuses and fetal membranes of aborting animals.

Ante mortem and postmortem findings:

In cattle

- Abortion in non-vaccinated pregnant cows in the last 3 - 4 months of pregnancy
- Occasional inflammation of testes and epididymis
- Swelling of scrotum (one or both sacs)
- Edematous placenta and fetus
- Hygroma on the knees

In sheep

- Fever, increased respiration and depression
- Inferior quality of semen in rams
- Edema and swelling of scrotum
- In chronic stage enlarged and hard epididymis, thickened scrotal tunics and frequently atrophic testicles
- Infertility in rams and abortion in ewes

Judgment:

- Cattle carcass is approved (after removal of affected parts),
- In acute abortive form (after the miscarriage), cattle carcasses are condemned.

Figure 46. Hygroma on the knee joints. This condition may be a sequel to Brucella abortus infection.

Control 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, placentae 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 hands that 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

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. The main species are: M. Tuberculosis (human TB), M. bovis (Bovine TB) which is zoonotic), M. microti, M. avium Two major types of tuberculosis syndromes are recognized: (1). Pulmonary tuberculosis (PTB) and (2) Extra-pulmonary TB. Epidemiology of human TB shows increasing incidence in both developing and developed world. This is due to increasing population density in poor areas and HIV pandemic. TB in cattle leads to infection of various body organs including the mammary glands which makes infected milking cows to shed mycobacteria organisms in milk urine, uterine secretions, faeces and sputum. The figure 3.1 below shows multiple tubercles on the ribs and diaphragm of a bovine infected with tuberculosis.

Transmission of zoonotic tuberculosis. 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 of infected animals
- Postmortem examination of infected carcasses.

Ante mortem findings:

- Low grade fever
- Chronic intermittent hacking cough and associated pneumonia
- Difficult breathing
- Weakness and loss of appetite
- Emaciation
- Swelling superficial body lymph nodes

Postmortem findings:

Tuberculosis granuloma in the lymph nodes of the head, lungs, intestine and carcass. These have usually a well-defined capsule enclosing a caseous mass with a calcified center. They are usually yellow in color in cattle, white in buffaloes and greyish white in other animals. Active lesions may have a reddened periphery and caseous mass in the center of a lymph node.

- Inactive lesions may be calcified and encapsulated
- Nodules on the pleura and peritoneum
- Lesions in the lungs , liver, spleen, kidney
- Bronchopneumonia
- Firmer and enlarged udder, particularly rear quarters
- Lesions in the meninges, bone marrow and joints

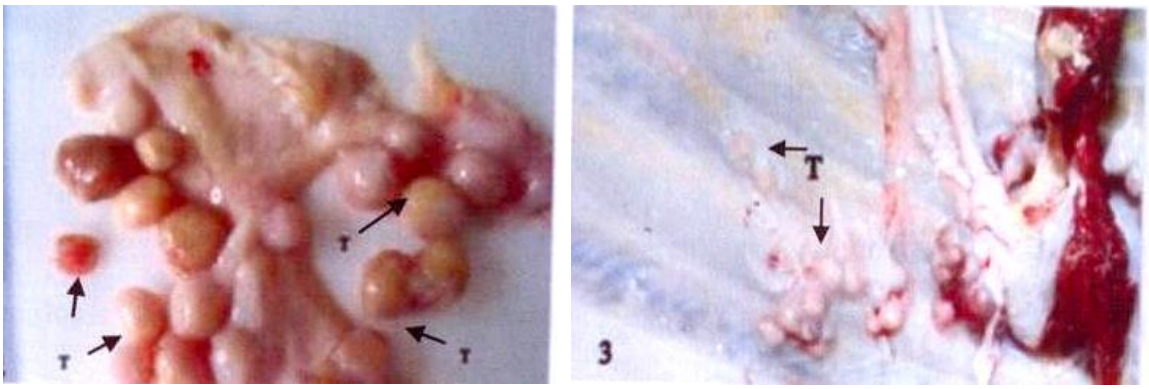

Figure 47. A. Multiple tubercles attached to the diaphragm of a bovine carcass; B. Multiple tubercles attached onto the ribs of a bovine carcass.

Judgment: Carcass of an animal affected with tuberculosis requires additional postmortem examination of the lymph nodes, joints, bones and meninges.

- Carcasses are condemned

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

iii) Viral zoonotic diseases:

a) Foot and Mouth Disease (FMD, Aphthous fever):

FMD is an acute viral and extremely contagious disease of cloven footed animals such as cattle, sheep, goats, pigs and antelope.

Ante mortem findings:

Before vesicle formation:

- Incubation is 1 - 5 days or longer
- Morbidity: Nearly 100 %
- Mortality: variable (50 % in young animals, 5 % in adults)
- Fever up to 41.7°C
- Dullness
- Lack of appetite
- Drastic drop in milk production.
- Smacking and quivering of lips
- Extensive salivation and drooling
- Shaking of feet and lameness
- Uneasiness and muscle tremors After vesicle formation

Postmortem findings:

- Necrosis of heart muscle, usually only in young acutely infected animals.
- Ulcerative lesions on tongue, palate, gums, pillars of the rumen and feet.

Judgment:

- In countries or in zones within a country free or nearly free of FMD diseased or suspect animals are *prohibited to be admitted in an abattoir* or slaughtered.
- If FMD is suspected on postmortem examination the carcass and viscera are *condemned* and appropriate action recommended by the regulatory authorities of the country must be taken.
- In countries where this disease is present, the judgment should be *in accordance with the current animal health requirements*, and consisted with effective public health protection.

b) Rabies:

This is an acute infectious viral disease of the central nervous system in mammals.

Ante mortem findings:

Furious form

- Incubation from 2 weeks to 6 months or longer
- Restlessness
- Aggressive, may attack other animals
- Sexual excitement
- Bellowing
- Paralysis and death

Paralytic form

- Sagging and swaying of the hind quarters
- Drooling and salivation
- The tail is held to one side
- Tenesmus or paralysis of the anus
- Paralysis
- The animal falls to the ground

Postmortem findings: Possible inflammation of gastrointestinal mucosa

Judgment:

- In endemic areas carcasses *may be approved* if the animal was bitten eight days before slaughter and within 48 hours of slaughter.

- The bite area and surrounding tissue must be *condemned*, and prevention taken to prevent occupational hazards.

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 notifiable disease.

Ante-mortem findings: special symptoms are absent. In sheep it is characterized by

- High morbidity and mortality particularly in young lambs, rapid course, fever, diarrhea, nasal discharge.
- Abortion in pregnant ewes
- Lambs usually die within 24 hours of the onset of symptoms
- In cattle, the disease is less sever and less fatal, abortion in pregnant cows
- High mortality in calves.

Post-mortem lesions:

- Cyanotic visible mucosa
- Necrosis of liver in lambs (liver may be mottled grey, or reddish brown to bright yellow colored)
- Edematous and hemorrhagic gall bladder
- Hemorrhage of GIT, serosa, internal organs and lymph nodes.
- Partial erosion of ileum, caecum and colon
- Fetal hemorrhage, haemothorax

Judgment*:* -

- Total condemnation of the carcass and viscera

Self-Check 1 – Written Test

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

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

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

1. Icterus is the result of an abnormal accumulation of bile pigment, bilirubin, or hemoglobin in the blood tha leads to condemnation of carcass/offals.
2. Incomplete bleeding can be caused by stress, ineffective stunning techniques or an ineffective bleeding cut.
3. Carcass of an animal affected with tuberculosis requires additional postmortem examination of the lymph nodes, joints, bones and meninges

Test II. Choose the best answer for the following questions (5 point).

1. Which of the following diseases is characterized by showing abdominal swelling due to presence of cysts in the lungs, liver or any abdominal organ in human?
   A. Hydatidosis
   B. Tuberculosis
   C. Anthrax
   D. Contagious bovine plueropnuemonia

Test III. Short Answer Questions (20 point)

a. What are the pathological conditions found at post mortem inspection? Describe and discuss their judgement.

b. .Write the post mortem finding for the f following listed diseases.

   1. Contagious bovine pleura pneumonia (CBPP):
   2. Anthrax
   3. Rabies
   4. Rift valley fever
   5. Hydatidosis

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

You can ask your teacher for the copy of correct answers

Information Sheet 2- Explaining effect of conducting slaughter in unhygienic area

2.1. Introduction

Fresh meats have been implicated for number of meat borne infections and intoxications in several countries. Microbial population that comes in contact with fresh meat during slaughtering, dressing and processing presents a challenging problem to the meat industries. Meat is a major source of protein consumed all over the world, it has high nutrient and water composition, and therefore, it should be kept clean and free from microorganisms that can be detrimental to our health. Microbial contamination can reduce the quality of fresh meat, shorten its shelf-life and cause economic losses and health hazards.

The most important issue in all meat-processing plants is maintenance of proper hygiene and adequate sanitary conditions. At most municipal abattoir, ante mortem examination is nil as animals are offloaded and conveyed straight to the slaughter halls. The multiplicity of contamination sources and the variability in facilities and practices of slaughtering and processing operations may lead to variations in types of microorganisms and, especially, extent of contamination introduced in meat and poultry, which may also vary with individual herds or flocks, animals or birds, geographic location and season of the year.

Microorganisms are introduced through a variety of sources when the sterile muscles of healthy animals and birds are exposed to the environment during slaughter, cutting and further handling. These sources include

- Contaminated air,
- Contaminated water,
- Contaminated soil,
- Feces,
- Contaminated feed,

- Contaminated hides, hair, feathers, wool, intestines, and lymph nodes, processing equipment, utensils and humans.

2.1 Consequences of conducting slaughter in unhygienic area

- **Health implications of unhygienic meat**
  - ✓ Food borne intoxication
  - ✓ Food borne infection
  - ✓ The risk of the transmission of zoonotic infections
- **Economic implication**
  - ✓ Food quality deterioration
  - ✓ Loss of production
  - ✓ Loss of gaining foreign currency
  - ✓ Costing billions of dollars in medical care and medical and social costs.
  - ✓ Banning from international trade

Self-Check 2 – Written Test

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

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

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

1. Microbial population that comes in contact with fresh meat during slaughtering, dressing and processing presents a challenging problem to the meat industries.
2. Conducting animal slaughter in unhyienic enviroment does not affect the quality and production period of the process.

Test II. Short Answer Questions (5 point)

1. Write are the concequences of conducting animal slaughtering in unhygienic environment in terms of public health and economic importance

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

You can ask your teacher for the copy of correct answers

Information Sheet 3- Assuring meat quality and hygiene maintenance

1.1 Introduction

Food spoilage is the decomposition of food components resulting in change in quality, appearance, colour, flavour, texture and odor. Food spoilage result from:

- Growth and activity of spoilage microorganisms which produce various enzymes that decompose the various constituents of food.
- Action of enzymes of plant or animal tissues which start the decomposition of various food components. These enzymes if present in the food must be inactivated in order to preserve the food.
- Chemical reactions of non-enzymatic nature. These include reactions between product and packaging material, oxidation of fat, milliard reaction in milk and a reaction between proteins and lactose.

Factors affecting microbial growth in food

1 Intrinsic factors: These are factors that are inherent in the food which affect microbial growth. They include nutrient content of the food, water content of food (also called water – aw), pH, moisture content, oxidation reduction potential, antimicrobial substances and biological structures.

- Nutrients content of the food
- pH of the food
- Available water in foods (water activity)

ii). Extrinsic factors:

These are factors external to the food that affect microbial growth. They include temperature of storage, humidity of storage environment, presence and concentration of gases.

- Oxygen requirements
- Temperature
- Relative humidity

Food spoilage leads to:

- Wastage of large quantities of food
- Economic losses
- Health problem

Food 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. Food preservation aims at

- 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 and flavour of food.
- Protecting food against attack by pests during storage.

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.

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

are exerted whether the acid is added directly to food, is a constituent of the food, or is produced in the food by fermentation.

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

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.

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 drying can 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, birds and 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 hang 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.

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

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

1. Aids in preservation
2. Adds the desired flavour, and
3. Improve colour 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 principle:** In this principle, spoilage microorganisms are destroyed in the food and thereafter the food is protected against subsequent contamination by being enclosed 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.

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

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-flavours.

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 learn the 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.

Self-Check 3 – Written Test

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

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

Test I. Write true if the statement is correct/False if it is incorrect for the following questions (6 point each).

1. Food spoilage is the decomposition of food components resulting in change in quality, appearance, colour, flavour, texture and odor.
2. 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

Test II. Choose the best answer for the following questions (3 point each).

1. Food spoilage result from:
   A. Growth and activity of spoilage microorganisms
   B. Action of enzymes of plant or animal tissues
   C. Chemical reactions of non-enzymatic nature
   D. All of the above
2. Which one of the following is is incorrect regarding food pasteurization process?
   A. Low temperature, long time (63^{o}C for 30 minutes)
   B. High temperature, short time (78^{o}C for 15 seconds)
   C. Flash method at 80^{o}C for 1-2 seconds/or continuously
   D. All of the above

Test III. Short Answer Questions (10 point)

1. Describe and discuss principles which are employed in food preservation.
2. What is food preservation by use of low temperatures?

Note: Satisfactory rating - 14 points **Unsatisfactory - below 14 points**

You can ask your teacher for the copy of correct answers

Information Sheet 4- Describing risk of consuming raw meat and meat products

4.1 Introduction

The consumption of raw foods/meat or uncooked foods may probably give some effects or implications to human health; whether the effects are beneficial or dangerous to human. According to science, eating raw foods has its own pros and cons. Generally, some people nowadays prefer a raw foods diet because of the potential health benefits and advantages. This is due to the people awareness to protect their health as they believed that raw foods will give the positive effect. According to the former research that has been made, raw foods have less processing and fewer added ingredients. Thus, this is a great advantage and benefit to the person who choose this kind of raw foods as their dishes.

Another benefit that can be found through consuming raw foods is that the enzymes contained in those foods can be preserved. Enzymes are defined as the protein molecules which is found in plants and also made by the human body. The act of cooking the foods is believed to destroy the enzymes found in it. Generally, many of the people who support raw foods diet believe there are health benefits of eating foods with the preserved enzymes.

4.2 Raw meat and meat products

There is scientific research which proved that consuming raw foods, i.e. the raw meat may give negative impacts on human health. Factually, a large body of research has been conducted on the high risk for pathogenic bacterial contamination of raw meat diets and the potential risks posed by this problem. Like any raw meat products we encounter at home or in restaurants, raw meat diets actually have the potential to carry pathogenic bacteria or dangerous microorganism. Some of those bacteria are unlikely to have negative effects on health, but others can have serious consequences if they were transmitted to human.

Example of bacteria that may exist when people consume raw meat in their diets

- Escherichia coli (E. coli). E. coli is usually found mainly on the surface of the meat.
- Salmonella
- Listeria
- Moreover, eating raw meat may cause a person to suffer from other food-borne illness.
- The other bacteria can potentially contaminate beef and cause food poisoning if the meat is eaten raw. Viruses, such as the hepatitis A virus can also be contracted from contaminated and raw meat.
- Besides, consuming undercooked or raw beef or meat also increases the risk for being infected by parasitic infections, such as beef tapeworm.

Therefore, it can be concluded that consuming or eating raw meat will expose a person or an individual to the health risks. This is because raw meat contains a lot of dangerous bacteria that will affect our health. Those bacteria are very dangerous and people should avoid themselves from being infected by them. Avoid from eating raw meat and it is better if people nowadays consume cooked meat rather than the raw meat. Once people suffer from infection, there is a probability to be infected with other illness. Thus, a person should prevent himself or herself from including the raw meat in his or her diet.

Self-Check 4 – Written Test

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

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

Test I. Write true if the statement is correct/False if it is incorrect for the following questions (4 point each).

1. Consuming undercooked or raw beef or meat ncreases the risk for being infected by parasitic infections.

Test II. Choose the best answer for the following questions (4 point).

1. Which one of the following bacteria that may exist when people consume raw meat in their diets?
   A. Escherichia coli (E. coli). E. coli)
   B. Salmonella
   C. Listeria
   D. All of the above

Test III. Short Answer Questions (6 point)

1. Describe all the concequences of eating raw meat.

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

You can ask your teacher for the copy of correct answers

Information Sheet 5- Undertaking disposal of part of carcass or organs found unfit

5.1 Introduction

Disposal of slaughter waste is a problem in many African countries. It is not uncommon to find slaughterhouse wastes including carcass trimmings, horns, hooves, bones, and manure accumulating in the vicinity of the slaughter facility causing environmental contamination and attraction of pests and scavengers.

Parts of carcass and organs unfit

- Blood
- Male/female reproductive organs including lactating udders/penis
- Gall bladder
- Bladder.
- Carcasses and portions of meat condemned by the meat inspector/veterinarian which poses a possible health threat. Such material must be held under secure conditions until disposed of in accordance with legislation.
- Crop in case of chickens
- Rectum/cloaca in chickens

Figure 49. Wastes from a slaughterhouse accumulated in the environment.

The wastes from a slaughter house are usually heavily polluted. Therefore, waste water from a slaughter house should not be allowed directly into a municipal drainage system without previous treatment. In the slaughter premises, the general principles regarding waste disposal are;

- The solid waste (e.g. sweepings from the floor of the dressing area etc.) must be separated from its liquid counterpart.
- Secondly, the liquid waste must be separated from the conventional drainage system of the toilets and bathrooms.
- The two lines should be separate and be identified before being joined together on the outside.

The purpose of this is to prevent contamination of the premises in the event of a back-up of conventional sewage in the early stages of discharge. A trap gully basin should be provided to collect residual solids, (especially fat) to prevent clogging of the system. Clogging can also result from discharge and coagulation of blood in the drainage system creating further back-up problems. It is therefore better to collect blood in special containers for disposal. The second phase of treatment involves bacterial breakdown of dissolved substances in the liquid phase. This process requires oxygen to convert organic matter into simple inorganic substances, which are removed by physical treatment or by chemical means. Only at this stage the water is considered treated, although it is not recommended for human use. This water can be used for agricultural purposes or be discharged into the sea, rivers or streams.

Figure 50. Bone wastes from a slaughterhouse accumulated in the environment.

5.2 Disposal of condemned material/offal and unfit products

Any condemned material must be disposed of by –

- Total incineration;
- Denaturing and burial of condemned material at a secure site, approved by the provincial executive officer and local government, by –

- Slashing and then spraying with, or immersion in, an obnoxious colorant approved for the purpose; and
- Burial (After the site has been approved by Department of Environmental Affairs) and immediate covering to a depth of at least 60 cm and not less than 100 m from the abattoir, providing such material may not deleteriously affect the hygiene of the abattoir; or
- Processing at a registered sterilizing plant.
- With special approval from the Provincial Executive Officer of Veterinary Services certain of the condemned material can be made available for carnivorous animals, crocodiles and for vulture restaurants.

Manure/Waste Disposal

Digestive and excretory wastes of ruminants, collectively referred to as manure, are a mixture of dung and urine and occur in two forms:

- As sweepings from lairages which are built into heaps outside the slaughter building and collected from time to time in small quantities by small farmers to be used as fertilizer.
- And as kraal manure which is less preferred, as it involves manure remaining permanently on the holding grounds, which may create problems of collection.
- Manure is usually utilized for composting but can also be used for biogas (fuel) production.

Self-Check 5 – Written Test

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

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

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

1. Carcasses and portions of meat condemned by the meat inspector/veterinarian which poses a possible health threat.

2. Denaturing and burial of condemned material at a secure site, approved by the provincial executive officer and local government

Test II. Short Answer Questions (6 point)

1. Describe carcass, offal and byproducts that are need condemnation.

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

You can ask your teacher for the copy of correct answers

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