ANIMAL HEALTH CARE SERVICES LEVEL- IV

BASED ON MARCH 2018, VERSION 3 OCCUPATIONAL STANDARDS

MODULE TITLE : PARTICIPATE IN PRESCRIPTION AND ADMINISTRATION OF VETERINARY DRUG

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LG 57	LO 1. Identification and Control of Drug Use and Associated Risk Management

Instruction sheet

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

- Recognizing and reporting risk
- Following workplace procedures and work instructions
- Following safe work practices
- Following workplace and management procedures of emergencies
- Undertaking effective communication using technical terms of drug
- Undertaking basic safety checks on all equipment

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

- Recognize and report risk
- Follow workplace procedures and work instructions for controlling risks
- Follow safe work practices
- Follow workplace and management procedures of emergencies
- Undertake effective communication using technical terms of drug
- Undertake basic safety checks on all equipment

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- Recognizing and reporting risk in the veterinary drug

1.1. Hazards, risks, exposures and effects

Dangerous chemicals or drugs are often used and handled in workplaces. The risk of injury or ill health upon exposure to the hazards of the chemicals at work depends on whether there are adequate safety measures in place. Using personal protective equipment (PPE) is one of the safety measures, and is often regarded as the last resort, supplementary to control measures, in providing protection to the employees. Despite the use of PPE is often considered as a passive way to control risk, with thoughtful management, a very proactive PPE programme can be developed.

Chemical hazards and risks in the workplace

In chemical safety term, "hazard" refers to the inherent hazardous properties of a chemical or a chemical operation, while "risk" means the likelihood of the hazardous properties of a chemical or the hazards of a chemical operation causing harm to people and the severity of that harm.

Hazards: Chemical hazard irritant to skin and eyes, irritant to lungs.

Exposure: Eye and skin contact with chemical, inhalation of chemical dust.

Effects: Blisters/burning of skins, irritation/burning, including permanent damage to eye, lung function impairment / burning to lung.

Hazard: (any factor that can cause damage to personnel, property or the environment.

Risk controls: (any process in place for controlling a hazard).or risk control is action taken to eliminate or reduce the likelihood that exposure to a hazard will result in injury or illness to people or damage to property/environment

Risk Management; risk management is a systematic process of hazard identification, risk assessment, and risk control with the aim of providing healthy and safe conditions

1.1.1 Risk management process

1. **Identify the Hazard:** A hazard is a source or potential source of injury, ill health or disease. Hazard identification is the process of identifying all situations and events that could cause injury or illness by examining a work area/task for the purpose of

identifying all threats which are 'inherent in the job'. Tasks can include, but may not be limited to using tools, hazardous chemicals, dealing with people, lifting/moving items and mustering.

2. **Assess the risk/characterization:** Risk register assigns risk ratings to a range of identified safety hazards and is useful in quickly determining risk. Activities that are given a severe or major risk rating require immediate safety measures to be applied and work activity should be ceased or only proceed with extreme caution.
3. **Control the hazards:** The most important step in managing risks involves eliminating the risk so far as is reasonably practicable, or if that is not possible, minimizing the risks so far as is reasonably practicable to prevent death and serious injury, in line with the Hierarchy of Risk Control
4. **Review the Process**
5. **Review the risk:** Continuously review the risk management strategies to monitor and improve control measures and find safer ways of doing things
6. **Documentation for risk assessment:** The documentation required for a risk assessment will depend on the operation or activity being assessed.

1.1.2 Exposure pathways

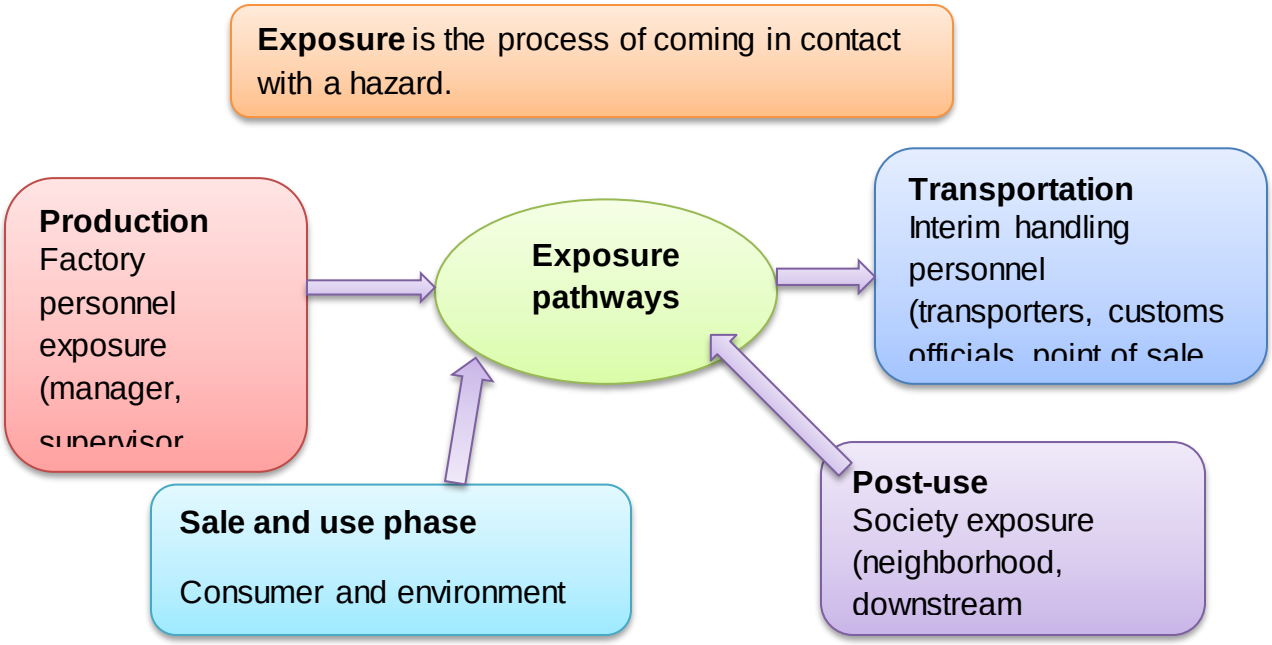

Figure 1. Hazard exposure pathways

Effects, also known as hazard end points, are the possible result of exposure to the hazard.

- Aimal toicity
- Human Toxicity
- EnvironmentalToxicity

1.1.3 Hazard end points/effects

- •Irritation of skin, eyes and respiratory tract.
- Narcosis and anesthesia, Genetic damage to following generations.
- Systemic poisoning of liver, kidneys, nervous
- system and reproductive system.
- Cancer, Damage to the fetus

A residue, defined in the simplest terms, results when a drug or pesticide is deliberately applied to a food-producing animal or. plant. Residues of veterinary drugs include the parent compounds and/or their metabolites in any edible portion of the animal product and include residues of associated impurities of the veterinary drug concerned. Residual amounts of antimicrobials or their toxic metabolites found in meat, organs or other products such as milk and egg of food producing animals is called veterinary drug residues

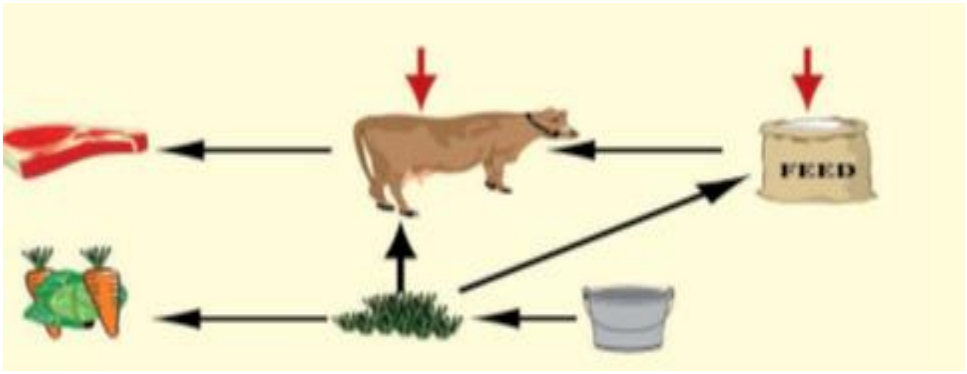

Figure 2. Formation of residues in food.

Table 1. Main classes of antimicrobials and potential risks.

Class	Health risks
Sulfamides	Allergies (with skin rashes), Sweet's syndrome, leukopenia
Quinolones	Immediate hypersensitivity reactions (urticaria, angioedema, anaphylaxis), exanthema, Sweet's syndrome
Beta-lactamines	Immediate reactions: urticaria, angioedema, rhinitis, bronchospasm and anaphylaxis, haemolyticanaemia, neutropenia, eosinophilia. Skin rashes, Stevens-Johnson syndrome, Lyell's syndrome
Tetracyclines	Drug hypersensitivity syndrome, drug-induced lupus erythematosus such as a rash, anaphylaxis, Dress syndrome, Sweet's syndrome
Aminoglycosides	Allergic contact dermatitis
Phenicols	Rare bone marrow suppression: aplastic anemia
Macrolides	Rare

Anaphlactic shock and its management

Anaphylaxis is the quintessential medical emergency. Anaphylaxis is a severe, rapidly progressive allergic reaction that is potentially life threatening. The most common allergens in school aged children are peanuts, seafood, eggs, tree nuts (e.g. cashews), dairy, fish and shellfish, wheat, soy, sesame and certain insect stings (particularly bee stings). Anaphylactic shock in dogs is a veterinary emergency which must be attended to by a professional in a clinic. A professional will have the needed medication to treat this shock, including; **adrenaline, antihistamines or corticosteroids**. **Anaphylaxis** is a severe, life-threatening, generalized or systemic rapid-onset hypersensitivity reaction (allergic or non-allergic). **Anaphylactic shock** is a severe rapidly progressing anaphylactic reaction (anaphylaxis) resulting in a life-threatening drop in blood pressure.

The most frequent causes of anaphylaxis:

1) **Allergic**:

a) Drugs: Most commonly beta-lactam antibiotics, cytotoxic agents.

b) Hymenoptera venoms.

c) Proteins administered via parenteral routes, including blood and its products, enzymes (eg, streptokinase), sera (eg, tetanus immunoglobulin), allergens used for in vivo diagnosis and immunotherapy.

d) Foods: In adults most commonly fish, seafood, peanuts.

e) Inhaled allergens, for instance, animal dander.

f) Latex.

g) Dialysis membranes sterilized with ethylene oxide.

h) Vaccines grown on chick embryo culture, which may contain egg protein.

Physical exam findings

- **Dark mucous membranes**

  Mucous membrane (gum) color reflects blood perfusion. Healthy gums are pink in color. Lola's gums were a dark muddy pink, indicating pooling of blood.
- **Delayed capillary refill time**

  Capillary refill time (CRT) is the time it takes for color to return to the gums after the pressure applied by something, such as a finger, is released. Normal capillary refill time is less than two seconds. Lola's initial capillary refill time was four seconds, indicating poor perfusion.
- **Hemorrhagic (bloody) diarrhea**

  Indicates injury to tissue lining the intestines.
- **Semi-comatose state**

  Upon presentation Lola was laterally recumbent with a diminished response to stimuli. Hypothermic, Normal body temperature for dogs is between 99.5-102.5 degrees Fahrenheit. Lola's initial temperature was below normal at 95.5 degrees.

Diagnostic results

- **Hemoconcentration**

  Hemoconcentration is an increase in the concentration of cells and solids present within the bloodstream as a result of decreased plasma volume. Lola had the following elevated values:

  ✓ Red blood cell count =concentration of red blood cells

- ✓ Hemoglobin = oxygen carrying protein in red blood cells
- ✓ Hematocrit = proportion of red blood cells to fluid in blood

- **Azotemia**

  Azotemia is a condition in which the blood contains abnormally high levels of nitrogen containing compounds such as urea or creatinine. These nitrogenous waste products are normally filtered and excreted from the bloodstream by the kidneys. Elevated levels of BUN (blood nitrogen urea) and creatinine in the blood indicate kidney damage. In Lola's case the azotemia was likely caused by decreased blood flow to the kidneys since she displayed other signs of decreased blood perfusion (delayed CRT, dark mucous membranes).

- **Hyperphosphatemia (elevated blood phosphorous)**
  - ✓ Excess phosphorous is normally removed from the blood stream by the kidneys. Elevated blood phosphorous can indicated kidney damage.
- **Hypoglycemia (low blood glucose)**

  Low blood sugar can occur in certain breeds of puppies and kittens if they aren't eating well, but this is not a common finding in adults. Hypoglycemia can occur in sepsis, anaphylactic shock and administration of too much insulin in diabetic patients.

- **High ALT (alanine aminotransferase)**

  Alanine aminotransferase is an enzyme produced by the liver. It can be leaked into the bloodstream following liver damage due to injury such as decreased blood perfusion.

Diagnosis

Anaphylactic shock- a severe condition in which the body initiates a heightened inflammatory response to an allergen which results in extensive dilation of blood vessels and increased vascular permeability, decreasing blood perfusion and oxygen delivery to tissues. Anaphylaxis may be triggered by food, drugs, or insect stings like bees or wasps.

- **Intravenous (IV) fluid with dextrose**

  IV fluids were given to increase plasma volume and prevent cardiovascular

collapse due to extensive vasodilation. Dextrose is a sugar which was added to increase her blood sugar levels. The fluids were changed to a balanced electrolyte solution without dextrose once her blood sugar stabilized.

Treatment

- **Epinephrine:** was given to induce vasoconstriction. By constricting blood vessels, epinephrine increases blood pressure and improves circulation in shock patients.
- **Dexamethasone sodium phosphate (Dex SP)**: Dex SP is a steroid which was given to suppress the inflammatory immune response initiated during the anaphylactic reaction.
- **Cerenia:** is an anti-nausea medication given to Lola to help prevent vomiting.
- **Metronidazole:** is an antibiotic which also has anti-inflammatory effects in the bowel. This was given to prevent against a secondary bacterial infection and to help with Lola's bloody diarrhea.
- **Diphenhydramine:** is an anti-histamine used to suppress the immune response to the allergen and help with any pain or itching.
- **Vetstarch:** is a type of intravenous fluid therapy used to increase plasma volume. It was given to Lola when IV dextrose was backed off in an effort to raise her blood pressure.
- **Prednisone:** is also a steroid used to suppress the inflammatory response. It was given after the Dex SP wore off and is a less potent immunosuppressant.

Risk assessment methods

The 4 step risk assessment process

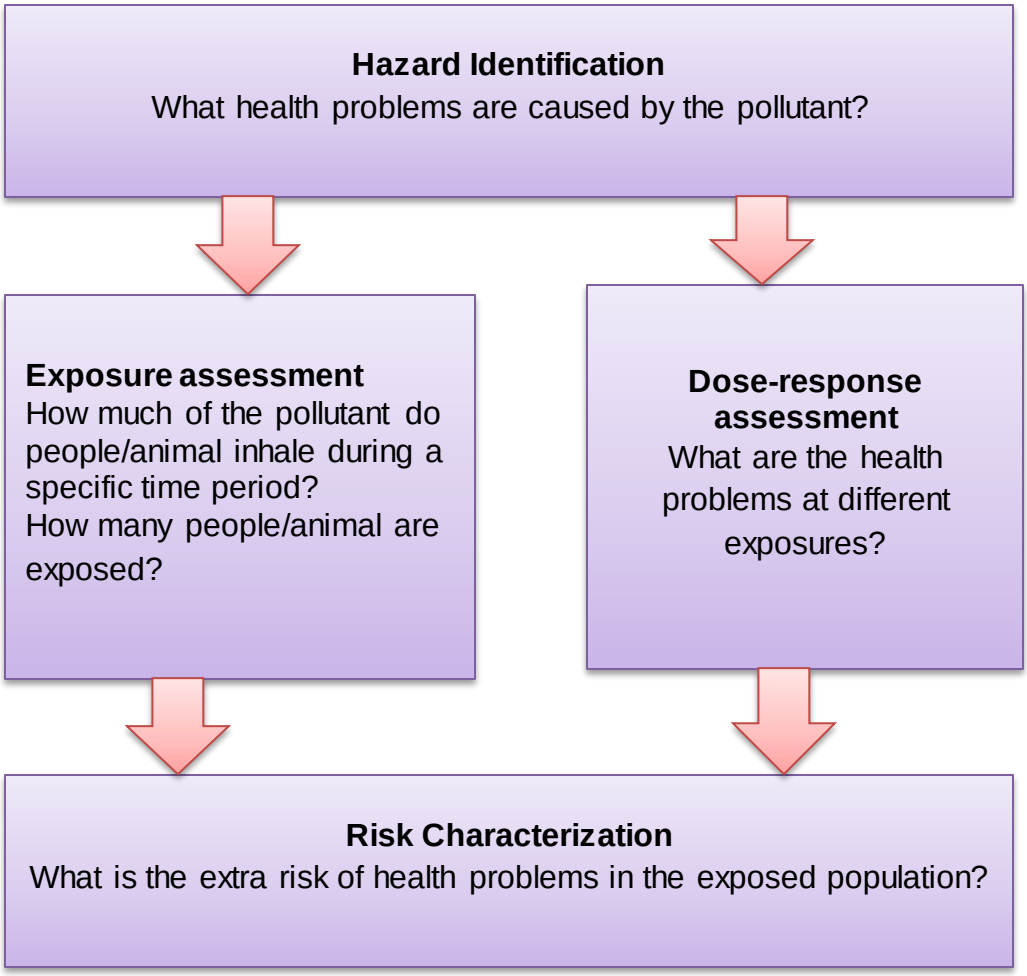

Figure 3. Step risk assessment process

Mechanisms to protect health and safety of public and animals

The hierarchy of controls listed below should be followed to most effectively protect veterinary medicine and animal care workers from workplace hazards. Different categories of methods for controlling hazards are listed in general order of effectiveness. However, an individual preventive intervention may be more or less important than suggested by its' general category. Some examples are provided. Often a combination of engineering and administrative controls and personal protective equipment (PPE) are needed to adequately protect workers from workplace hazards.

PPE should be used only when other controls cannot effectively reduce hazardous exposures.

- **Elimination:** remove the hazard from the workplace e.g., do not admit animals for which the facility is not properly equipped
- **Substitution:** switch to the use of a less risky hazard e.g., switch to the use of safer chemicals
- **Engineering controls:** prevent exposure to a hazard or place a barrier between the hazard and the worker e.g., install an effective waste anesthetic gas scavenging system
- **Administrative controls:** implement changes in work practices and management policies e.g., require rabies pre-exposure vaccination for workers at risk
- **PPE:** use gloves, safety eyewear, masks, hearing protection, respirators, or other protective equipment e.g., require the use of hearing protection in an animal shelter with barking dogs

Worker training: Veterinary medicine and animal care workers should be trained about hazards before they begin work. Refresher training should be conducted at regular intervals as required or as needed. Training should include information about the following:

- Potential workplace hazards.
- Occupational risks for pregnant and immunocompromised workers.
- Effective use of controls for reducing workplace exposures.
- Veterinary standard precautions including infection control practices.
- Safe handling, restraint, and care of animals.
- Preventing needle stick, scalpel, and sharps injury.
- Proper care and use of PPE.
- Prompt reporting of work-related injuries and illnesses.
- Emergency and evacuation procedures.

1.2. Reporting risk in the veterinary drug stores

1. Purpose

State the purpose/objective of writing the report clearly to the respective body**.**

Hazard and Incident reporting procedure is designed to:

• Identify potential hazards to the health and safety of staff, students and visitors

• Encourage early reporting and corrective actions;

• Reduce the number of incidents arising

• Enable senior management to identify areas of concern; and

• Facilitate corrective action to address the causes of the hazards or incidents.

2. Definitions

Corrective action: Any action taken to eliminate or remedy an undesirable situation or condition.

Incident:

- Work illnesses;
- fire and explosion;
- Physical injuries;
- Minor injuries;
- Equipment plant or property damage;
- Dangerous occurrences which could have, but did not injure any person;
- Exposure to hazardous substances or circumstances;
- Material harm to the environment is caused or threatened:
- Any other incident that could put workers or plant at risk

Notifiable incident is an event that must be reported to the Regulator, that is

- The death of a person, or
- A serious injury or illness of a person, or
- A dangerous incident

3. Procedure

3.1 Identifying a hazard or incident

Workers may identify a hazard during their normal day-to-day activities, or during a planned inspection or audit. An incident is one where it meets the criteria in the

definition above. All hazards and incidents must be reported as soon as practicable after the event.

3.2 Recognise and respond

- Assess the situation and at no time put yourself or others in danger
- Inform a supervisor if possible.
- Assess the need to trigger emergency response
- Immediate actions may include raising alarm, evacuation, access control
- Initiate response for rescue, medical, fire, security, isolation, containment
- Consider site preservation and data gathering for investigation phase
- Consider debrief, counselling,

3.3 Completing a hazard and incident report

3.4 Incident investigation: The supervisor responsible for the person who reported the hazard or incident must carry out an investigation

3.5 Reporting Incidents to Authorities

3.6. Record keeping: Workplace Managers must maintain copies of all documentation used as part of the hazard and incident investigation and control process.

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. Hazard is any factor that can cause damage to personnel and property
2. Administrative controls is a tool changes in work practices and management policies

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

1. Any process in place for controlling a hazard or risk is:
   A. Risk controls
   B. Risk management
   C. Risk communication
   D. Risk assessment
2. _____remove the hazard from the workplace, do not admit animals for which the facility is not properly equipped
   A. Administrative controls
   B. Elimination control
   C. Substitution control
   D. All of the above
3. Which one of the following is the effects of hazard end points:
   A. Aimal toicity
   B. Human Toxicity
   C. EnvironmentalToxicity
   D. All of the above

Test III. Short Answer Questions (5 point)

1. What are the purpose of reporting risk in the veterinary drug stores

Note: Satisfactory rating 15 points Unsatisfactory - below 15 points

You can ask your teacher for the copy of correct answers

Information Sheet 2- Following workplace procedures and work instructions

2.1. Terms used in workplace safety procedures and instructions

Consultation and participation: Management or the owners of a business/organisation must consult with employees about OHS matters that can directly affect them in the carrying out of their duties.

Emergency situations/incidents: Any situation that may arise unexpectedly that could cause injury or harm to any person in a workplace.

Employee and employer responsibilities: Employees must take reasonable care to ensure the safety of themselves and others, and comply with all OHS requirements.

Hazard identification and risk control: Identifying any hazard as a source of potential harm to people, or damage to property, and reducing risk.

Occupational Health and Safety (OHS): OHS concerns the health and safety of all people in a workplace, including employers, employees and visitors

Safe work practices and procedures: These provide practical guidance to business on how to fulfil their duty to provide a safe and healthy workplace.

Workplace accidents, injury or impairment: Unexpected events that cause physical harm or damage to people or property.

2.2 The components or elements of workplace safety procedures

1. **Observe the task/activities**: t is important to observe the task/activity being performed the preferred way to ensure safest method is documented.
2. **Review associated legislative requirements:** Some task/activities are governed by legislative requirements. These must be considered when developing a safe work procedure to ensure any legal requirements are included.
3. **Record the sequence of basic job steps:** write down the steps that make up the task/activity.
4. **Record potential hazards of each step:** Next to each step identify what may have potential to cause injury or disease

5. **Identify ways of eliminating and controlling the hazards**: list the measures that need to be put in place to eliminate or control any likely risk.
6. **Test the procedure:** Observe staff/student following the safe work procedure
7. **Obtain approval:** Before the safe work procedure can be used it must be approved by each approver nominated.
8. **Monitor and review: Make** sure the activity is supervised to ensure the documented process is being followed.

Employers of veterinary medicine and animal care workers should:

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

2.3. Workplace instructions for controlling risks

Work instruction: A document describing specific activities and tasks within the organization. It contains the greatest amount of detail. As a component of a process, "defines how one or more activities in a procedure should be executed in detail, using technology or other resources. A written description or instruction covering each simple detailed step.

Difference between work instructions and procedures

Another way of looking at work instructions v procedures is that:

Procedures describe:

- What is the activity is
- Who performs it
- When it is performed

Work instructions describe:

- How the activity is performed.

Purpose of work instructions

'A work instruction is a tool provided to help someone to do a job correctly. This simple statement implies that the purpose of the work instruction is quality and that the target user is the worker. Unfortunately, in many workplaces, today's work instructions have little connection with this fundamental focus.

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. Workplace accidents/injury is unexpected events that cause physical harm or damage to people or property.
2. Work instruction is a document describing specific activities and tasks within the organization.

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

1. _____concerns the health and safety of all people in a workplace, including employers, employees and visitors.
   A. Employee and employer responsibilities
   B. Occupational health and safety
   C. Work instruction and procedures
   D. Emergency situations
2. Procedures describe:
   A. What is the activity is
   B. Who performs it
   C. When it is performed
   D. All of the above

Test III. Short Answer Questions (6 point)

1. What is the difference between work instruction and procedure?

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

You can ask your teacher for the copy of correct answers

Information Sheet 3- Following safe work practices

3.1 Introduction

Safe work practices are generally written methods that define how tasks are performed while minimizing risks to people, equipment, materials, environment, and processes. Safe Work Procedures are documented procedures for performing tasks. Safe Work Procedures are documented procedures for performing tasks. The purpose of a safe work procedure is to reduce the risk to health and safety in the workplace and reduce the likelihood of an injury by ensuring that employees know how to work safely when carrying out the tasks involved in their jobs. Safe work procedures may also be called safe work method statements (SWMS).

The purpose of a safe work procedure is to reduce the risk to health and safety in the workplace and reduce the likelihood of an injury through improving employees know how to work safely when carrying out the tasks involved in their jobs. Another term for safe work procedures is safe work method statements (SWMS).

Different types of workplace safety procedures and instructions

Handling chemicals: these involves procedures on how to handle chemicals in workplace where these are used.

Lifting and moving objects: are procedures that pertain to how objects are to be lifted and moved safely and without strain to the person or worker.

Working at heights: these are procedures that underscore what a worker must observe to keep himself safe while working in an elevated structure or environment.

Slips, trips and falls: are procedures that pertain to safety procedures that should be in place to prevent slips, trips and fall accidents in the workplace.

Electrical equipment: these are safety procedures that pertain to the installation, repair and maintenance of electrical equipment.

When hazards have been found that cannot be removed from the workplace, safe work practices and procedures can help reduce risk to workers. Safe work practices provide workers with general directions on how to safely do a job not always completed the same way and procedures give workers detailed instructions on how to safely do their jobs from start to finish. Safe work practices and procedures are the foundation for skill training and competent workers. They may also be used in coaching, mentoring, and observation programs to make sure workers know how to safely do their jobs.

Requirements

An OHS program needs procedures to make sure jobs are evaluated and workers receive instructions and general direction on safety, quality and efficiency. To ensure practices and procedures are implemented an employer should develop a process to:

- Inventory occupations or positions, jobs within each occupation and tasks
- Complete critical task inventory by prioritizing high risk job tasks
- Record the steps for each critical task and identify the potential human, equipment, material or environmental loss
- Communicate the importance of safe work practices and procedures, the potential risk and consequences of not following them
- Review them to make sure they are working and update them when needed (i.e. after a high-potential for serious injury or fatality, or serious loss or after significant changes are made

3.1 Effective safe work practices and procedures consider the:

- Target audience, their information needs, the literacy levels
- Review of practices and procedures to make sure they do not have too much or too little detail
- Process to consult with workers when developing
- Process to make sure practices and procedures mirror how work is carried out
- Develop practices and procedures for all critical work tasks
- Need for workers to be trained before work is conducted
- Use of practices and procedures in skill training, competency assessment, coaching, mentoring and observation programs.

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. Safe work practices are generally written methods that define how tasks are performed while minimizing risks to people, equipment, materials.
2. Effective safe work practices and procedures consider the need for workers to be trained before work is conducted

Test II. Choose the best answer for the following questions (8 point).

1. The purpose of a safe work procedure is:
   A. Reduce the risk to health and safety in the workplace
   B. Reduce the likelihood of an injury through improving employees know how
   C. Reduce the risk to the animals and environment

Test III. Short Answer Questions (10 point)

1. What is safe work practice?

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

You can ask your teacher for the copy of correct answers

Information Sheet 4- Following workplace and management procedures for emergencies

4.1 Introduction

Workplaces need a plan for emergencies that can have a wider impact. Special procedures are needed for emergencies such as serious injuries, explosion, flood, poisoning, electrocution, fire, release of radioactivity and chemical spills. Quick and effective action may help to ease the situation and reduce the consequences. However, in emergencies people are more likely to respond reliably if they: are

- Well trained and competent
- Take part in regular and realistic practice
- Have clearly agreed, recorded and rehearsed plans, actions and responsibilities

Write an emergency plan if a major incident at your workplace could involve risks to the public, rescuing employees coordinating emergency services.

4.2. Points to include in emergency procedures

- Consider what might happen and how the alarm will be raised.
- Don't forget night and shift working, weekends and times when the premises are closed, e.g holidays
- Plan what to do, including how to call the emergency services. Help them by clearly marking your premises from the road. Consider drawing up a simple plan showing the location of hazardous items
- If you have 25 tons or more of dangerous substances, you must notify the fire and rescue service and put up warning signs
- Decide where to go to reach a place of safety or to get rescue equipment. You must provide suitable forms of emergency lighting
- Make sure there are enough emergency exits for everyone to escape quickly, and keep emergency doors and escape routes unobstructed and clearly marked
- Nominate competent people to take control (a competent person is someone with the necessary skills, knowledge and experience to manage health and safety)

- Decide which other key people need, such as a nominated incident controller, someone who is able to provide technical and other site-specific information if necessary, or first-aiders
- Plan essential actions such as emergency plant shutdown, isolation or making processes safe.
- Clearly identify important items like shut-off valves and electrical isolators etc.
- Train everyone in emergency procedures.
- Don't forget the needs of people with disabilities and vulnerable workers
- Work should not resume after an emergency if a serious danger remains.

Chemical storage and handling

There are many ways in which to work with chemicals to reduce the probability of an accident and to reduce the consequences of such an accident to minimal levels. Risk minimization depends upon safe practices, appropriate engineering controls, the proper use of Personal Protective Equipment, the use of the least quantity of chemicals necessary, and when possible, the substitution of less hazardous chemicals. Essentially, chemical safety is inherently linked to other safety issues.

Chemical safety guidelines

- Assume that any unfamiliar chemical is hazardous.
- Know all the hazards of the chemicals that you work with.
- Consider each mixture of chemicals to be at least as hazardous as its most hazardous component chemical.
- Never use any substance that is not properly labeled.
- Follow all chemical safety instructions precisely.
- Minimize exposure to any chemical, regardless of its hazard rating.
- Use personal protective equipment as appropriate.
- Avoid repeated exposure to any chemical is unprotected.

When working with chemicals:

1. Remove and use only the amount of chemicals needed for the immediate job at hand.
2. Properly seal, label, and store chemicals in appropriate containers.
3. Check stored chemicals for deterioration and broken containers.
4. Do not store chemicals near heat or sunlight or near substances which might initiate a dangerous reaction if combined.
5. Do not pour hazardous chemicals down sink drains.
6. Clean-up spills and leaks immediately, using only established spill procedures.
7. Be aware of emergency procedures which have implications for hazardous chemical exposures and spills.
8. Dispose of chemicals using only established disposal procedures.

Emergency

An emergency is any unplanned event that can cause deaths or significant injuries; or that can shut down the university, disrupt operations, cause physical or environmental damage, or threaten the reputation of the university. There are many but these generally include:

- Fire
- Hazardous materials incident
- Flood or flash flood
- Earthquake
- Communications failure
- Radiological accident
- Civil disturbance
- Loss of auxiliary services
- Explosion
- Biological agent release (bioterrorism)
- Chemical spill/leakage

4.3 Emergency management steps

Any emergency management initiative must start with an inventory of risks and an assessment of the exposure form these risks. Infrastructure issues will likely be seen as the ones that present the most risk. The key steps in emergency management are:

1. **Mitigation**: is defined as "sustained action that reduces or eliminates long-term risk to people and property from natural hazards and their effects." Mitigation is the

ongoing effort to lessen the impact disasters may have on people and property. Mitigation involves such activities as avoiding construction in high-risk areas such as floodplains, engineering buildings to withstand wind and earthquakes, and more.

2. **Preparedness:** is simply preparing for an emergency before it occurs. Obviously, it is important to not just plan, but to prepare as well. The key to effective emergency management is being ready to provide a rapid emergency response. Being ready includes training and exercises as well as logistics. Everyone needs to be prepared.
3. **Response:** includes the action of responding to an emergency. Trained and equipped personnel will be required to deal with any emergency situation.
4. **Recover**: is the process of returning to normal. Salvage, resumption of business processes, and repair are typical recovery tasks.

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. Workplaces need a plan for emergencies that can have a wider impact.
2. Mitigation is simply preparing for an emergency before it occurs.

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

1. Points to include in emergency procedures are:
   A. Consider what might happen and how the alarm will be raised.
   B. Do not forget night, weekends and times when the premises are closed
   C. Plan what to do
   D. Make sure there are enough emergency exits
   E. All of the above

Test III. Short Answer Questions (10 point)

1. What are the emergency management steps? Describe and disccus breifly.

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- Undertaking effective communication using technical terms of drug

5.1 Introduction to terminology of drugs

Drug: Any substance or product that is used or intended to be used to modify or explore the physiological system or pathological state for the benefit of the recipient.

Pharmacy: from Greek word the **art, practice,** or profession of preparing, preserving, compounding, and dispensing medical drugs.

Pharmaceutics: the discipline of pharmacy that deals with the process of turning a new chemical entity (or old drugs into a medication to be used safely and effectively by patients (includes pharmaceutical formulation, pharmaceutical manufacturing, dispensing pharmacy, pharmaceutical technology, physical pharmacy, pharmaceutical jurisprudence).

Pharmacology: the branch of medicine and biology concerned with the study of drug action, where a drug can be broadly defined as any man made, natural, or endogenous (from within body) molecule which exerts a biochemical and/or physiological effect on the cell, tissue, organ, or organism.

Pharmaceutical Chemistry: the study of drug design to optimize pharmacokinetics and pharmacodynamics and synthesis of new drug molecules.

- **Pharmacodynamics:** quantitative study of drug action.
- **Pharmacokinetics:** quantitative study of how drugs are taken up, bio logically transformed, distributed, metabolized, and eliminated from the body.

Pharmacogenomics: the study of the role of genetics in drug response (more general).

Drug development: the process of bringing a new pharmaceutical drug to the market once a lead compound has been identified through the process of drug discovery.

Pharmacopeia: book containing directions for the identification of compound medicines, and published by the authority of a government or a medical or pharmaceutical society.

Medicine: chemical substance used to treat, cure, prevent, or diagnose a disease or to promote well-being So, medicines are substances or combinations thereof coming in

contact with the human or animal body, penetrating into the organs and tissues of the human or animal body, used for prophylaxis diagnostics treatment of disease, rehabilitation as well as for maintenance, prevention or interruption of pregnancy as may be derived from blood, blood plasma, human or animal organs and tissues, plants and minerals by synthesis methods or using biological technologies.

Active pharmaceutical ingredient (**API):** the chemical molecule in a pharmaceutical product (medicines we buy from the chemist) that lends the product the claimed therapeutic effect

Excipient: non-active pharmaceutical ingredient

Medicine = API + Excipients

Figure 4. Ingredients of medicine

Over the counter (OTC): drugs can be bought without prescription as they have proven long term safety.

Prescription only medicine (POM): these medicines cannot be purchased without a doctor's prescription.

Dosage form: the physical form of a drug. It is a medicinal product form that conditions its state, with a view to the method of administration for achievement of the optimal efficiency of the medicinal product.

Formulated drug: dosage form of drugs made from APIs mixed with excipients.

Figure 5. Drug dosage forms

Shelf life: the period of time during which a pharmaceutical product, if stored as indicated on the label, is expected to comply with the specification as determined by stability studies on a number of batches of the product

Drug safety: a positive medicinal product characteristic which is based on comparative analysis of its efficiency and assessment of the risk of causing harm to human life and health.

Drug efficiency: characteristic of the degree of positive impact exerted by the medicinal product on prevention, course or duration of the disease or condition, prevention of pregnancy, recovery of normal vital activity of a human organism and compensation of its functions impaired as a result of disease.

Drug availability: providing the population with timely medical care the saturation of the domestic market with safe, effective and good quality medicines.

5.2 Original (Brand Name) Drugs and Generics

Generic and brand name drugs have identical active ingredients, and generic drugs must meet Health standards for bioequivalence. Bioequivalent drug formulations have the same bioavailability; that is, the same rate and extent of absorption. Although the active ingredients are the same, the excipients (inactive ingredients) may differ. This is only important in rare cases when a patient has an allergy or sensitivity to one of the excipients

Nomenclature and presentation of drugs,

All drugs have at least three names:

- Chemical name
- Non- proprietary/ Generic name
- Proprietary/ Trade/ Brand name

Brand name drugs

- Also called “innovator drugs”
- Initially marketed as new chemical entities
- First version sold by the innovator

Generic Drugs

- Copies of brand name drugs
- Produced after the original patent expires

The chemical name. It is referring to the chemical makeup of a drug rather than to the advertised brand name under which the drug is sold.

Official name. Is the name provided by the pharmacopoeia and is expressed in Latin (ex: Coffeinum et natrii benzoas for caffeine sodium benzoate). The official name it is used mostly by researchers and by those working in the preclinical stage.

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. Dosage form means the physical form of a drug.
2. Over the counter medicines cannot be purchased without a doctor's prescription.

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

1. The discipline of pharmacy that deals with the process of turning a new chemical entity (or old drugs into a medication to be used safely and effectively by patients.
   A. Pharmacy
   B. Pharmacology
   C. Pharmaceutics
   D. Pharmacokinetics
2. _____characteristic of the degree of positive impact exerted by the medicinal product on prevention, course or duration of the disease.
   A. Drug availability
   B. Drug safety
   C. Drug efficiency
   D. Drug formulation

Test III. Short Answer Questions (10 point)

1. What is the difference between generic and brand name of drugs

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

You can ask your teacher for the copy of correct answers

Information Sheet 6- Undertaking basic safety checks on all equipment before operation

6.1 Introduction

A maintenance schedule should be in place to ensure that you maintain your equipment regularly. Always check equipment as often as suggested by the manufacturer or more often if indicated by the risk assessment. Any daily checks should be undertaken as recommended by the manufacturer. This will help prevent problems such as blockages, leaks or breakdowns, which can increase risks. The duty to maintain work equipment and take measures to manage the risks from maintenance (Provision and Use of Work Equipment Regulations) builds on the general duties of the Health and Safety at Work Act, which requires work equipment to be maintained so that it is safe, and work to be undertaken safely, so far as reasonably practicable

Equipment checks required by law

Some types of equipment - require examinations by law in addition to normal repair and servicing. This is known as thorough examinations by a competent person, Examples include gas appliances, lifting equipment, pressure systems and power presses. Keep the certificates and records of such checks, detailing the findings and any repair work. All treatment, vaccination, personal protective, sterilization, and other all-important equipment should be checked for their proper functionality.

6.2. Equipment checks

Appoint a competent person for health and safety

As an employer, you must appoint someone competent to help you meet your health and safety duties. A competent person is someone with the necessary skills, knowledge and experience to manage health and safety.

Appoint (one or a combination of):

- Yourself
- one or more of your workers

- someone from outside your business

Many smaller businesses can develop the necessary expertise in-house and are well equipped to manage health and safety themselves. Probably already deal with most issues yourself, with the help of your staff, and can do the same for health and safety.

Decide whether can deal with health and safety yourself,

Getting external health and safety advice

If the staffs are not confident in ability to manage health and safety in-house, or need help with a specific issue, you may decide to get external help. There are a number of different sources of external advice. These include:

- Health and safety training providers
- Health and safety equipment suppliers
- Local councils
- Safety groups
- Trade associations
- Trade unions
- Consultants

Considerations when using external help

Make sure clearly explain what you need and check that they understand. Ask them:

- What they will do
- When they will do it
- What they will charge you
- Whether they have the necessary personal indemnity insurance

Check for evidence of relevant training and knowledge, such as formal qualifications or practical experience. Check with the professional body on what training, knowledge or qualifications are relevant and whether the person is listed as a member.

Shop around to find the right help at the right price. Check that the person is adequately insured. Finally, try to make sure that get a good follow-up service or check and are able to get further advice on any issues that arise from implementing their recommendations.

How to use the equipment checklist:

2. Use one (1) Checklist per machine. Select a machine by identifying any or all of the following criteria:
   - Machine/equipment seems unsafe and lacking in guarding
   - Machine/equipment has known safety incidents, i.e., near misses, lost time, etc.
   - Machine/equipment has frequent, unexplained downtime
3. Take a print-out of the safety checklist to the machine to begin the evaluation.
4. Answer each question as accurately as possible. Most of the questions listed pertain to specific safety standards set by governing bodies.

Machine/equipment safety checklist

Table 2. Equipment functionality/safety checklist

Company Name	**Machine Function:**	
Company Address:	**Machine Manufacturer:**	
Completed By::	**Model Number:**	
Title:	**Install Date:**	
Date:	**Check Date**	

	Safety checkpoints	**Yes**	**No**	**Don't know**	**Additional details**	
1.	Is Company Safety Standards documentation available?				Ate: Incident/fine	
2.	Have there been any safety incidents associated with this equipment?					
3.	Are control systems or safety devices in use?					
4.	Has a risk assessment been completed for this equipment?					
5.	Have all users of the equipment been given adequate training in correct use, risks and precautions?					
6.	Do Emergency Stops meet standard requirements (labeling)?					
7.						
Notes/comments						

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. The organization should be appoint a competent person for health and safety check of equipment.

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

1. What are different sources of external advice on how to check equipment and material safety?
   A. Health and safety training providers
   B. Health and safety equipment suppliers
   C. Local councils
   D. Safety groups
   E. All of the above

Test III. Short Answer Questions (6 point)

1. Discuss how to How to use the equipment checklist?

Note: Satisfactory rating 10.5 points **Unsatisfactory - below 10.5 points**

You can ask your teacher for the copy of correct answers

LG 58	LO 2. Manage and Administer Drugs, Biological and Fluids

Instruction sheet

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

- Following OHS procedures and using personnel protective equipment
- Preparing, reading and interpreting prescription papers
- Applying dosage formulation and route of drug administration
- Giving and assessing treatments/Vaccines effects
- Administering fluid therapy for controlling metabolic diseases
- Disposing waste
- Keeping and reporting record

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:

- **F**ollow OHS procedures and using personnel protective equipment
- Prepare, read and interpret prescription papers
- Apply dosage and route of drug administration
- Give and assess treatments/Vaccines effects
- Administer fluid therapy for controlling metabolic diseases
- Dispose waste
- Keep and report record

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. 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- Following OHS procedures and using personnel protective equipment

1.1 Following OHS procedures

Occupational Safety and Health (OSH) is concerned with the health, safety, and welfare of employees in the workplace.OHS is a multidisciplinary field concerned with the safety, health, and welfare of people at occupation. occupational health deals with all aspects of health and safety in the workplace and has a strong focus on primary prevention of hazards." Health has been defined as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." Occupational health is a multidisciplinary field of healthcare concerned with enabling an individual to undertake their occupation, in the way that causes least harm to their health. Occupational health and safety is concerned with addressing many types of workplace hazards, such as:

- Chemicals
- Physical hazards
- Biological agents
- Psychological fallout
- Ergonomic issues
- Accidents

To ensure a safe working environment follow safe work procedures

To prevent exposure of personnel to agents, chemicals and to prevent sharps and biohazards from showing up in the environment and/or being used by unauthorized personnel, proper disposal procedures must be followed.

- Preserving cleanliness, preventing pathogen build-up and breaking possible pathways of transmission
- Use safety equipments and tools
- Use herbicides and pesticides carefully and according to the manufacturer's instructions and applicable legislation such that animal exposure to these chemicals is minimised.

- Records of usage, including the date and location of application, should be kept.
- Ensure that when feed additives are used, that manufacturer's instructions as to dosage levels and withdrawal periods are followed, and that records of usage of such feed additives are kept.
- Use chemical disinfectants and cleansers strictly in accordance with the manufacture's instructions, ensuring that disinfected or cleaned surfaces and facilities are properly rinsed if necessary.
- Seek professional advice with regard to the use of disinfectants or cleansers.
- Maintain required storage conditions for veterinary medicines and biologicals.
- Ensure that all treatments or procedures are carried out using instruments that are appropriate and correctly calibrated for the administration of veterinary medicines and biologicals.
- Dispose of used instruments (including needles) in a biosecure manner.
- Keep all treated animals on the farm until the relevant withdrawal times have expired (unless the animals should leave the farm for veterinary treatment) and ensure that products from these animals are not used for human consumption until the withdrawal periods have elapsed.

1.2 Using personnel protective clothes and equipment

Hand Protection

Gloves should be selected for each procedure to provide protection from the hazards. In some circumstances there may be several hazards and glove selection may involve different gloves for different steps of the procedure and/or several layers of gloves may be needed to address all hazards. For example, when injecting radioactive materials into a research animal one may need a layer of disposable gloves for protection from the radioactive liquid augmented with a metal mesh glove for protection from animal bites

Figure 6. Disposable gloves

Skin and Body Protection

Laboratory coats, scrubs, uniforms and disposable body coverings provide a level of protection from splash hazards. Special hazards and material qualities such as flame resistance, specific chemical resistance, physical strength (e.g., leather) and visibility should be considered when selecting PPE for skin and body protection.

Figure 7. Disposable gawn, sleeve, and coverall respectively

Respiratory Protection

In a laboratory, airborne contaminants are kept very low through adequate general room ventilation and by working with open containers of volatile materials inside a chemical fume hood or enclosure designed to effectively capture air contaminants at the source. When airborne contaminants cannot be adequately controlled by engineered exhaust ventilation respiratory protection may be needed. The use of respiratory protection has very stringent regulatory requirements.

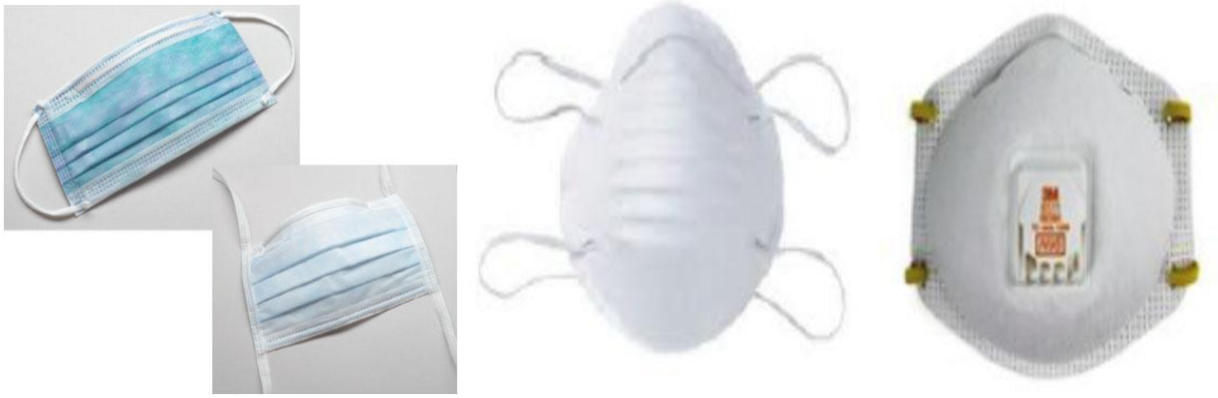

Figure 8. Surgical, dust and N95 respirator

Head Protection

Head protection may be as simple as a disposable bouffant surgical cap to protect the head from aerosols during surgical operations, or a hard hat to protect from overhead hazards. Electrical work may require arc flash protection of the head, face, hands and body; please consult your supervisor or safety staff for guidance.

Figure 9. Bouffant cap and flame resistant balaclava

Foot and Leg Protection

Foot protection may be simple disposable shoe covers to minimize spread of contamination. In food service and vivariums, slip resistant shoes may reduce the risk of slips, trips and falls. In shops and industrial activities, the supervisor must evaluate the hazards and select foot protection accordingly.

Figure 10. Shoe cover

Hearing Protection

In general, if workplace noise is loud enough that you cannot hold a conversation with a person one arm length away, then a noise assessment must be performed prior to PPE selection.

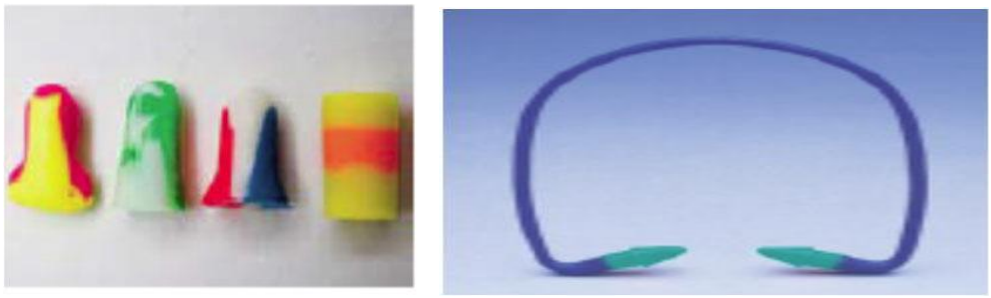

Figure 11. Ear plugs and canal caps

Safe use and removal of PPE

Select the right PPE for the task. Do not wear PPE that could potentially cause injury, such as loose fitting gloves that could be caught in moving parts of equipment or machinery. For loose fitting gloves, tape or fold a cuff on the gloves to prevent chemicals from running down the users arm. Do not wear PPE outside of laboratory or shop areas to prevent spreading contamination to other areas.

Employees must be trained in how to done and doff PPE and the limitations of the PPE for the specific procedure. Workers need to handle PPE safely when removing it from the body to avoid contaminating themselves and surfaces nearby. Disposable gloves,

sleeves, shoe covers and Tyvek clothing and potentially contaminated PPE such as aprons, lab coats and other items need to be removed so that any contamination is not exposed. Disposable items should be peeled off turning them inside out as they are removed. Reusable gloves, aprons and other potentially contaminated items should be rinsed off before removing them, and then peeled off or folded so that the contaminated surface is inside.

Inspection, maintenance and storage

The PPE must be inspected for defects every time it is put on. Look for symmetry; does each side look like a mirror image of the other or is one side distorted? Are there any broken, bent, frayed or torn pieces? Are the lenses scratched so they are hard to see through? Is the elastic still springy or is it stretched out? In addition to visual inspection as above, insulating gloves, sleeves and blankets for electrical workers must be electrically tested. All must be tested prior to initial use, and then every 6 months thereafter for gloves, and every 12 months for sleeves and blankets. PPE should be clean. If dirty, clean it with soap and warm water. Do not use solvents or abrasives to clean it. Store it out of sunlight in an area where it will be protected and kept clean. Replace reusable PPE every 2-5 years, earlier if recommended by the manufacturer or if there is a major impact. Replace any defective parts with parts made by the same manufacturer for that equipment. Do not make makeshift repairs. If it cannot be repaired properly, replace it. Do not use paint or glue on PPE. Use decals or stickers to mark it.

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. Airborne contaminants are kept very low through adequate general room ventilation and by working with open containers of volatile materials.

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

1. Occupational health and safety is concerned with addressing many types of workplace hazards, such as:
   A. Chemicals
   B. Physical hazards
   C. Biological agents
   D. Psychological fallout
   E. All of the above
2. To prevent exposure of personnel to agents, chemicals and biological the responsible body should be:
   A. Preserving cleanliness
   B. Use personal protective equipment
   C. Maintain required storage conditions for veterinary medicines and biologicals.
   D. Seek professional advice
   E. All of the above

Test III. Short Answer Questions (5 point)

1. Describe personal protective equipments?

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

You can ask your teacher for the copy of correct answers

Information Sheet 2- Preparing, reading and interpreting prescription papers

2.1 Introduction

Veterinary prescription drugs are labeled for use only by or on the order of a licensed veterinarian. Incidents involving the sale and use of prescription drugs without a prescription should be reported to the proper state authority and the. The veterinarian should inform clients to whom prescription drugs are delivered or dispensed about appropriate drug handling, storage, and disposal. In the clinic, veterinary prescription drugs should be stored separately from over-the-counter drugs, and be easily distinguishable by the professional and paraprofessional staff. Drugs should be stored under conditions recommended by the manufacturer. All drugs should be examined periodically to ensure cleanliness and current dating. Food animal clients should be advised that veterinary prescription drugs should be securely stored, with access limited to key personnel.

Definition of terms

Prescription: means an order from a veterinarian to a pharmacist or another veterinarian authorizing the dispensing of a veterinary prescription drug to a client for use on or in a patient.

Veterinary drug" means: A drug for animal use recognized in the official. A drug intended for use in the diagnosis, cure, mitigation, treatment, or prevention of disease in animals.

Preparing prescription of drug

There are two broad legal classifications of medications:

- The medications which can be obtained only by prescription which are referred as prescription drugs or legend drugs.
- The medications which may be purchased without a prescription, which are termed non-prescription drugs or over-the-counter (OTC).

Printed prescription forms are permissible and save a great deal of time. A full prescription paper should have the following.

1. The name and address of the patient/owner are required for reference in case of doubts or mistakes.
2. The Date must be included for the same purpose and a prescription reference number may also be included
3. The species of the animal
4. Diagnosis reached
5. **The superscription:** which is represented by the Latin sign. (℞). This sign represents ‘‘take thou’’ or ‘‘you take’’ or ‘‘recipe.’’ Sometimes, this sign is also used to denote the pharmacy itself.
6. **The Inscription: -** is the general content of the prescription. It states the name and strength of the medication, either as its brand (proprietary) or generic nonproprietary) name. In the case of compounded prescriptions, the inscription states the name and strength of active ingredients.
7. **The Subscription** represents the directions to the dispenser and indicates the type of dosage form or the number of dosage units. For compounded prescriptions, the subscription is written using English or Latin abbreviations.
8. Name and signature of the prescriber/professional

A typical prescription consists of the following parts:

1. Prescriber office information
2. Date
3. Patient information (name, age, sex and address of the Patient)
4. Superscription (symbol ℞)
5. Inscription (Medication prescribed) - Main part of prescription
6. Subscription (Direction to Pharmacist/Dispenser)
7. Signature or Transcription (Direction for Patient)
8. Renewal instructions
9. Prescriber’s signature and registration number.

Choosing drugs: The selection should be based on the rational diagnosis of the disease correlated with a knowledge of the applied pharmacology of drugs.

How to read doctor's physician's prescription

1. Know the parts of the prescription.

There are certain pieces of information that the doctor will always include on a prescription. The doctor's professional information, such as her name, address, and phone number, will be at the top of the form. In the upper section of the prescription sheet, there will be a place for animal name, age sex, address, and the date the prescription is given. Below this, the doctor will write the relevant drug information

- The dosage,
- Sign and date

2. Understand how to read the drug name.

The main purpose of prescription is to let the pharmacist know what drug is needed in what concentration. Typically, the doctor will write out the generic name for the drug. This is because the brand names for drugs can be spelled similarly and it might cause confusion or error at the pharmacy.

3. Read the dosage information correctly.

The number behind the name of the drug is the amount should take per dose. It will vary depending on the type of medication that are taking. For example, most pills will be in milligrams, but measurements can also appear in grams or micrograms. The doctor may write out the full word for this or she may write the abbreviations. The abbreviation for milligrams is "*mg"*, "*g*" is for grams, and"*mcg*" is for micrograms.

4. Learn the abbreviations for dosage methods.

On the prescription, the line underneath the drug and dosage concentration will be the instructions on how many doses the animal should take at one time and the method that should be used to take the medication. The main problem with being able to read these is that typically, doctors use medical shorthand, some based on Latin phrases that are not able to understand unless have a medical background.

5. Decipher how you should take the medication

Next to the dosage methods, the doctor veterinarians will write an abbreviation for how often the animal should take. This describes the number of times a day or week should give to the animal.

6. Look for refills

The veterinarians may authorize a certain number of refills for the prescription without needing to bring the animals for another examination or follow-up.

Table 3. Abbreviations used during prescription writings

Abbreviation	Meaning	Abbreviation	Meaning
d.t.d	**gi**ve of such doses	q4h	every 4 hours
aa.	of each	q.i.d	four time a day
tsp	teaspoonful	q.o.d	every other day
a.c	before meal	q.s	a sufficient quantity
a.d	right ear	s.i.d	once a day
a.s	left ear	sig	directions to on label
a.u	both ears	stat	immediately
ad.lib	freely as wanted	SC	Sucut, Subcutaneous
amp	ampule	ss.	half
b.i.d	twice a day	sos	If necessary, as needed
c.	with	Sol.	solution
cap	capsule	Susp.	suspension
cc	cubic centimeter	t.i.d	three times a day
Gtt	frop	h.s.	at bed time
IM	intramuscular	IV	intravenous
IP	intraperitoneal	o.d.	Every day
p.c.	after meal	p.o.	mouth, per os
Syr.	syrup	tab.	tablet
ID	intradermal	IT	intrathecal
Top.	topically	V or PV	vaginally

Table 4. Prescription format for physicians

PRESCRPTION PAPER		**Code**_____
Name of health institution…… Institution Name_____**Tel. No**____		
Name and Address of Owner…… **Name**_____**Tel.No**_____		
Patient History Sex: _____**Age:**_____ **Weight:** _____ **Tag No:** _____		
Region: _____ **Town:** _____ **Woreda:** _____		
Type of Diagnosis_____		
Superscription	**Drug name, Strength, Dosage form, Dose, Frequency, Duration, Quantity, How to use and other information**	**Price (Dispensers use only**
	RX	
Inscription	**Oxytetracycline 10%**	
	IM, for three days 10 ml per day	
Inscription	**30ml**	
	Total Price	
	Prescriber's	**Dispenser's**
Prescriber/dispenser information…. Full name_____		_____
	Qualification _____	_____
	Registration #_____	_____
	Signature_____	_____
	Date_____	_____

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. Veterinary prescription drugs are labeled for use only by or on the order of a licensed veterinarian.
2. Inscription means an order from a veterinarian to a pharmacist or another veterinarian authorizing the dispensing of a veterinary prescription drug to a client for use on or in a patient.

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

1. A typical prescription consists of the following parts:
   A. Prescriber office information
   B. Inscription
   C. Patient information (name, age, sex and address of the Patient)
   D. Superscription (symbol ℞)
   E. All of the above

Test III. Short Answer Questions (4 point)

1. How to read Veterinarian's/ physician's prescription paper? Describe and discuss.

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

You can ask your teacher for the copy of correct answers

Information Sheet 3- Applying dosage forms and route of administration

3.1 Introduction

A dose refers to a specified amount of medication taken at one time. t is the amount or quantity of medicine to be given or administered to the patient every time in a day. If it is 5mg, then 5mg is the dose to be given to the patient. In the field of medicine, nutrition, and anti-venom drugs, this word assumes significance in the wake of the health of the patient as this dose is what the body of the patient requires for recuperation or better health.

Dosage is the prescribed administration of a specific amount, number, and frequency of doses over a specific period of time. Dosage is the frequency of the medication. This means that the dosage not only tells the quantity of medicine to be given, but it also tells the frequency or the number of times a medicine has to be given to the patient.

Dosage form refers to the physical form that contains active pharmaceutical ingredient (API) combined with selected additional ingredients (excipients) and intended to be delivered to sites of action within the body by various routes of drug administration. Also, Dosage form is known as unit doses and drug products. For example,

Solid Dosage forms: Tablet, Capsule, Pellets, Pill, and Lozenge etc.

Liquid Dosage forms: Solution, Suspension, Emulsion, Elixir, Linctus, and Gargle

Semisolid Dosage forms: Ointment, Cream, and Paste etc.

Gaseous Dosage forms: Aerosol, and Insufflations

3.2 Formulations of drug dosage forms of animals are listed as following

1. **Oral dosage forms:** Refers to administration of drug through the mouth. The most commonly used preparations are solid oral dosage forms such as tablets, capsules, granules, powder, paste and boluses.
2. **Parenteral dosage forms:** The most common parenteral dosage forms are stable aqueous solutions and subcutaneous implants.

External dosage forms:

- Ointment- semisolid preparation for external application.
- Cream- a viscous semisolid, consisting of oil in water emulsion or water in oil emulsion.
- Dusting powder e.g., popular antibacterial agent applied on animal wounds.
- Lotion- an aqueous solution or suspension for local application.
- Spray-a drug applied in liquid form by pressure, forms gaseous and volatile liquid anaesthetic agent (drugs), given by inhalation, e.g., Halothane.

Inhalation dosage forms: gaseous and volatile liquid anaesthetic agent (drugs), given by inhalation, e.g., Halothane.

Criteria of classification of dosage forms

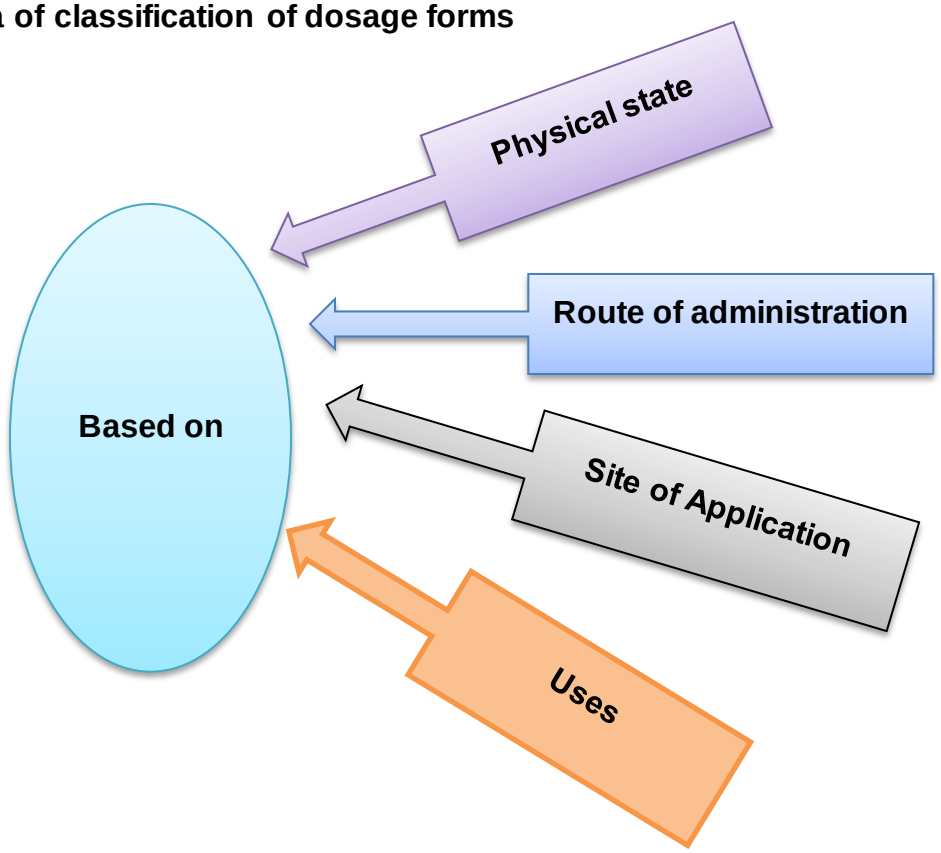

Figure 12. Criteria of classification of dosage forms

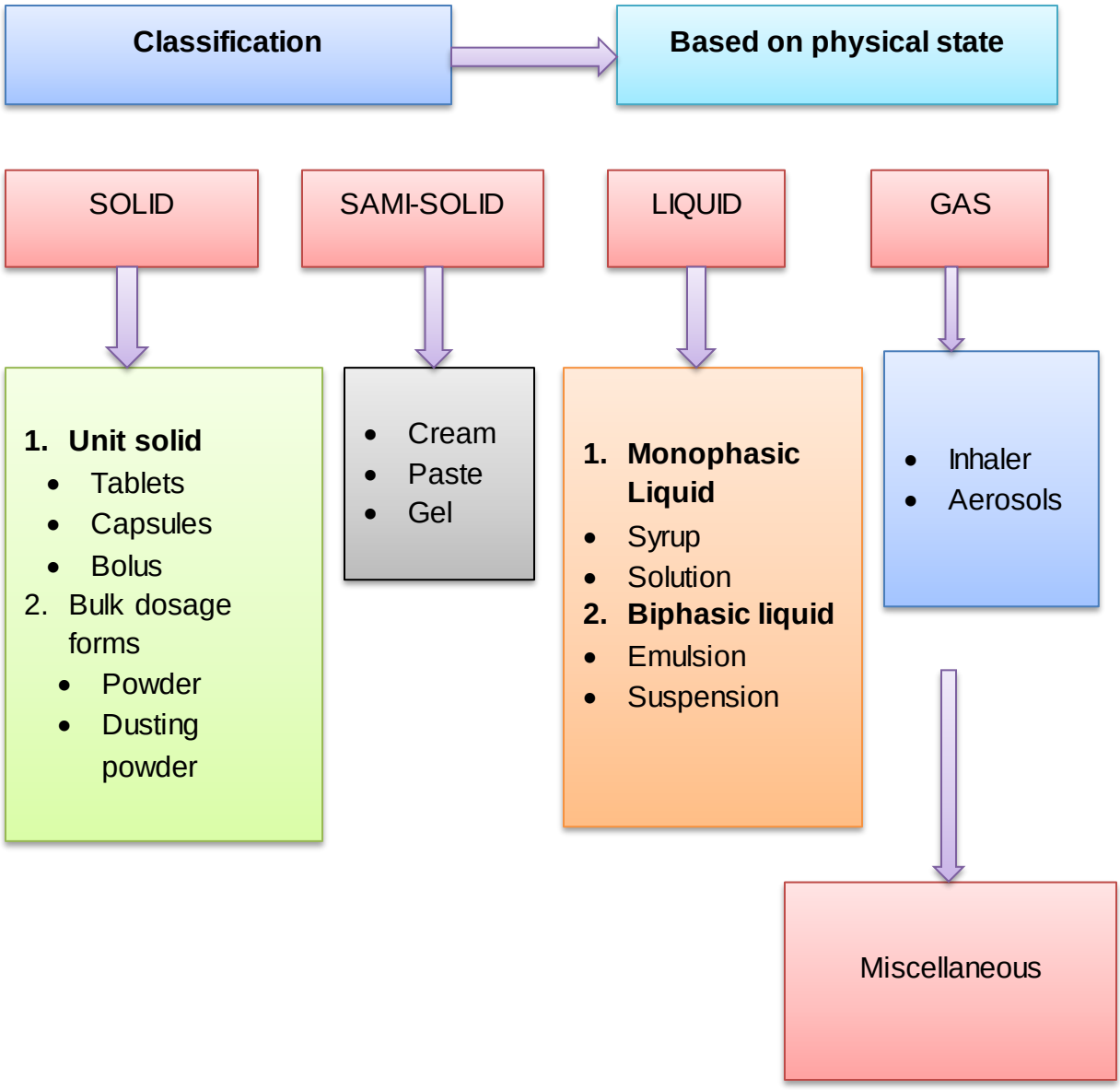

Figure 13. Classification of dosage forms based on physical state

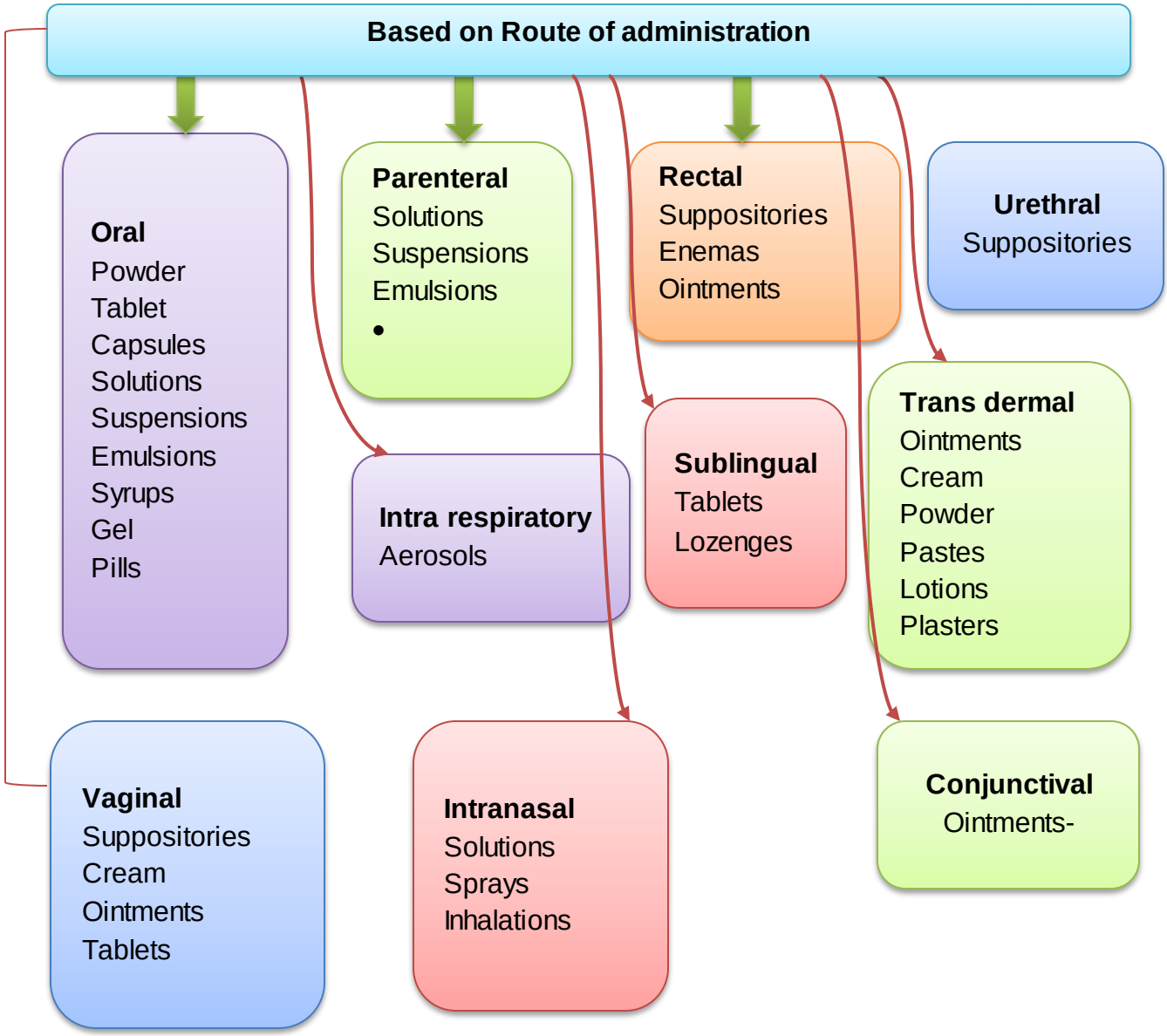

Figure 14. Classification of dosage based on routes of administration

Solid dosage forms

Powders: Solid dosage forms containing finely divided particles in micron size

Tablets: Solid dosage form containing medicaments with or without excipients

Granules: Aggregate of particles

Capsules: Drug enclosed with gelatin capsule

Cachets: Drugs enclosed with wafer sheet of rice

Pills: Small tablet containing excipients

Lozenges: Solid preparations containing sugar and gum used to medicate mouth and throat

Suppositories: Solid dosage containing medicaments with suitable suppository base that inserted in to the body cavities other than mouth, like rectum, nose, ear

Poultices: Solid dosage form converted to paste like preparation used externally in the skin to reduce inflammation

Liquid dosage forms

Collodions: Liquid preparations for external use having nitro cellulose used to protect the skin

Emulsions: Biphasic liquid dosage form for oral containing medicaments in which fine oil globules dispersed in continuous phase

Suspensions: Biphasic liquid dosage form for oral containing medicaments in which fine solid particles suspended in continuous phase

Enemas: Liquid preparation for rectal containing medicaments

Gargles: Concentrated aqueous solutions for external use used to treat throat infections

Gels: Aqueous colloidal suspensions containing medicaments used as antacids

Lotions: Liquid preparations for external application usually applied without friction

M**ixtures:** Liquid oral preparations containing one or more medicaments

Mouth wash: Concentrated aqueous solutions for external use used to treat mouth infections and oral hygienic

Nasal drops: Liquid preparations containing medicaments that are instilled in to the nose with a dropper used to treat nose infections and blockage of nose

Paints: Liquid preparations for external application to the skin or mucous membrane with soft brush

Solutions: Clear liquid preparation containing with or without medicaments used to internal or external preparations

Syrups: Sweet, viscous, concentrated liquid preparations containing with or without sugar and medicaments.

Semisolid dosage forms

Ointments: Semisolid dosage forms for external use containing with or without medicaments with suitable ointment base

Creams: Semisolid dosage forms for external use containing with or without medicaments with suitable fatty base

3. Paste: Semisolid dosage forms for external use containing high proportion of finely powdered medicaments with suitable fatty base

4. Gels: Transparent semisolid dosage forms for external use containing hydrophilic or hydrophobic base with gelling agents

5. Poultices: Semisolid dosage forms for external use containing medicaments applied to the skin to hold the dressing and protective.

Gaseous dosage forms

Aerosols: Suspension of fine solid or liquid particles with gas used to apply drug to respiratory tract having atomizer with in device

Inhalations: Internal liquid preparations containing medicaments dissolved in suitable solvent or if insoluble suspended in the propellent

Sprays: Gaseous preparations of drugs containing alcohol applied to mucous membrane of nose or throat with atomizer or nebulizer

3.3 Routes of drug administration

Medications are administered to cattle by injection for a variety of reasons. For example, vaccines (biological) are injected to prevent disease, and antibiotics or anthelmintic may be injected to treat bacterial or parasitic infections, respectively. Other medications may be given by injection for supportive medical care, to relieve pain or to enhance production. Injection may be the best, or the only, route of administration for a particular medication. The routes of drug administration in domestic animals are summarized as following form

Oral administration: There are large numbers of pharmaceutical preparations available for oral administration. Solid dosage forms (powders, tablet, capsules, pills, etc.) and liquid dosage forms (syrups, emulsion, mixture, drench, electrolytes, etc.)

Parenteral administration: (IV, IM, SC, Id, epidural, subconjunctival): It refers to a drug administration by injection directly in to the tissue fluid or blood without having to cross the intestinal mucosa

Intravenous route (IV): Gives swift, effective and highly predictable blood concentration and allows rapid modifi cation of dose and is used for emergency treatment. Jugular vein is the common route of drug administration in large animals (horse, cattle, sheep and goat) usually given through jugular vein, in pig-ear veins, in the dog and cat-cephalic veinand recurrent tarsal vein.

Intramuscular (IM) route: Absorption occurs either haematogenous or via lymphatic and is usually fairly rapid except for long acting preparation.

Subcutaneous (SC) route: Preferred when slow and continuous absorption of drug is required. The injected drug disperses through the loose connective tissues. They dissolve in tissue fl uid before it can enter either capillaries or lymphatic.

Intradermal route (ID): Used for testing hypersensitivity test and for vaccination.

Epidural route: Refers to deposition of drug up on or outside the dura matter. E.g. Introduction of local anesthetics between the first and second coccygeal vertebra and lumbosacral to eliminate straining.

Subconjunctival: Disposition of a pharmaceutical preparation beneath the conjunctiva.

Topical or local application: It refers to external application.

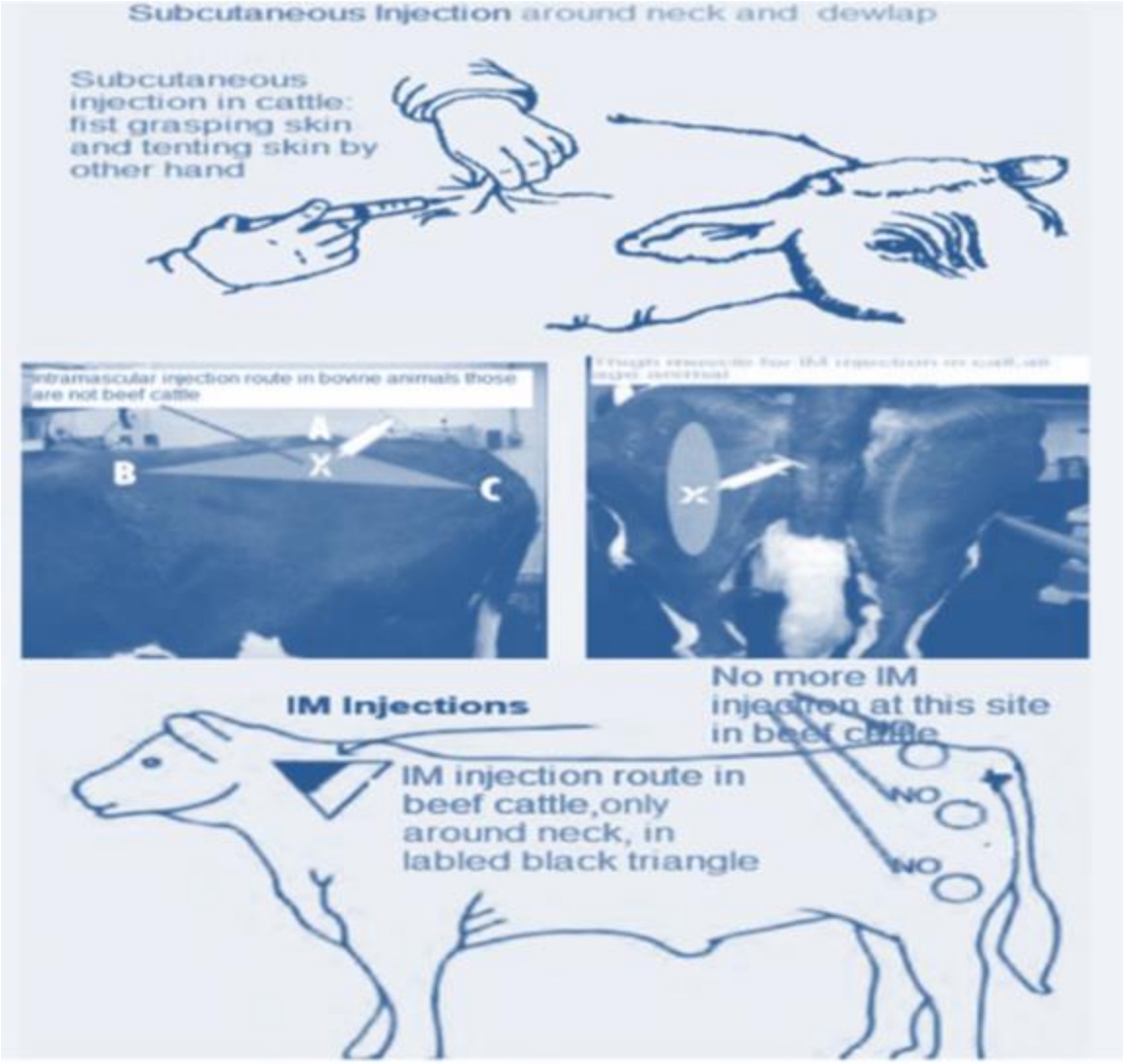

Figure 15. Parenteral route of drug administration in bovine animals

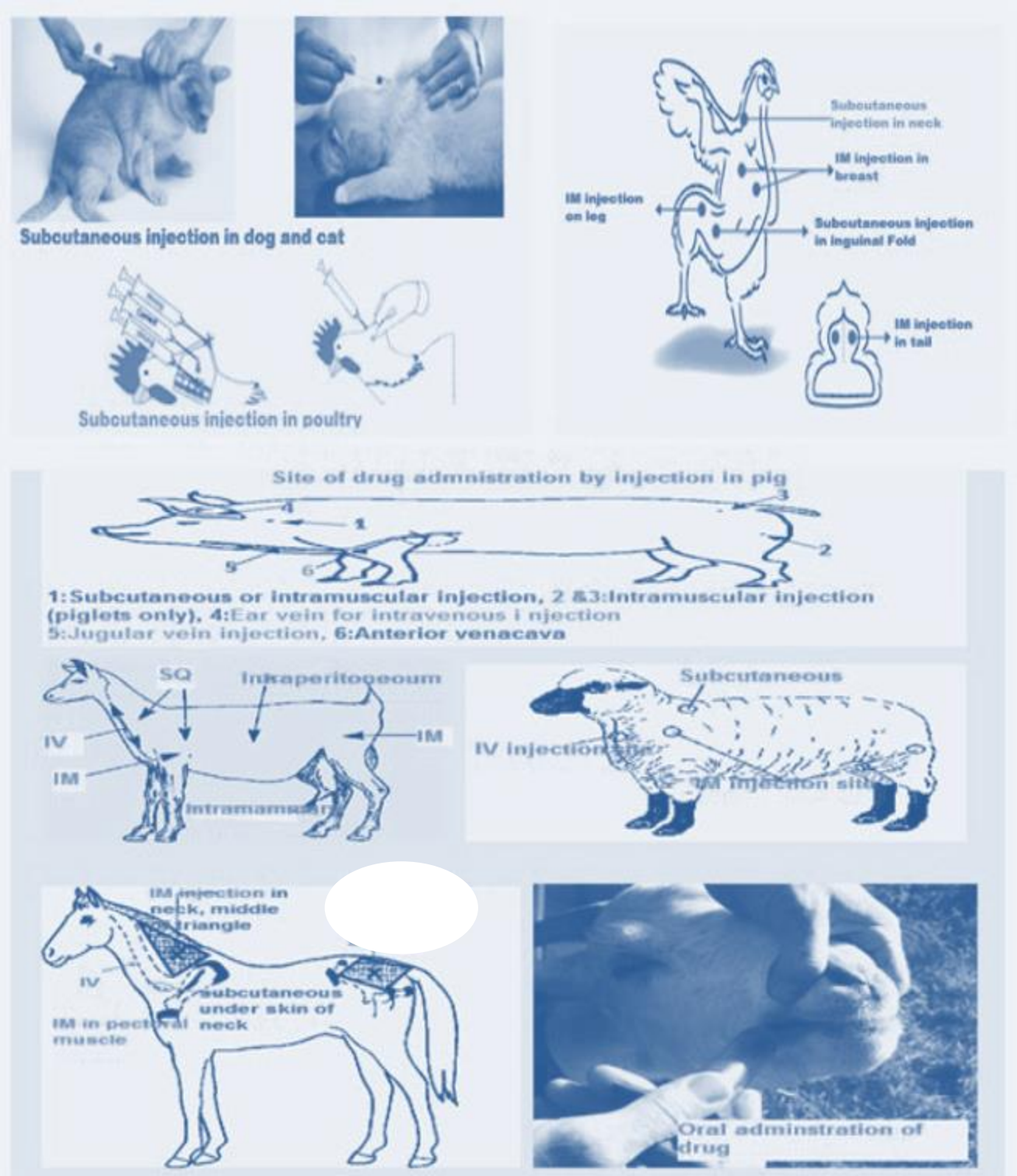

Figure 16. Route of drug administration site in domestic animals, cat, dog, poultry, pig, shoats and horse

Table 5. Site of parenteral injection in domestic animals.

Animal Species	Intra muscular injection site	Intravenous injection site	Subcutaneous injection site
Horse, Buffalo	Rump is avoided in horse it may cause some sensitivity like swelling, heat and pain. So neck muscle is the best for equine animals. Thigh also possible	Jugular vein	Horse have very little loose skin which to give SQ compared to Other domestic species.
Cattle, Yak		Jugular vein	Under the skin at the side of the neck
Sheep, Goat		Jugular vein	Behind the elbow or just over a rib, under the skin On the inside of the hind leg
Dog, Cat			Under the skin over the middle of the back
Chicken	Chest (breast muscle,) Pectoral muscle		Under skin at back of the neck
Pig	Thigh muscle		Inside the thigh At the back of the ear

Drug dose calculation

If drugs are used incorrectly, disease organisms can build up resistance making drugs ineffective. This usually happens from under dosing or overdosing drugs. It is best to calculate the correct dosage based upon the weight of each animal determined by using a scale or estimated by using heart girth measurement. Dose is the quantity of the drug to be administered at one time and expressed in mg/kg or IU/kg. General Equation for calculating and converting of the concentration of drugs.

$$Dose\ required\ (Equals\ drug\ volume\ in\ ml\ or\ cc) = (Body\ weight\ (kg)\ x\ dosage\ (mg/kg)) / (divide\ by\ Concentration\ of\ drug)$$

The unit conversion, 1 ml (milliliter) = 1 cc (cubic centimeter; 1 kg (Kilogram) = 2.2 lbs (pound); 1 cm =0.394 inch and 1 inch=2.54 cm; 1 foot=0.3048 cm and 1 cm=0.033

Convert the concentration of a solution expressed in percent into mg/ ml: Multiply percent figure by 10 = given % x 10 mg/ml.

Percent solution= Weight in gram x 100 divide by the volume of solution in ml.

Weight in grams = Volume of solution in ml x percent solution divide by 100.

Example: If one cow is presented to clinic, The Clinician Undergoes clinical examination and prescribed the Oxytetracycline 10%. The cow weighs 350 kg and requires a daily injection of 10% drug in solution at the 10 mg / kg dose rate. Calculate the volume of the dose to be administered for Cow.

Solution:

- 10% solution= 10 x10 mg/ml= 100 mg in 1ml.
- Dosage rate = 10 mg/kg
- Dosage rate x body weight = 10 mg/kg x 350 kg =3500mg
- The volume of drug required = 3500mg/100mg/ml = 35 ml/ day
- Vets often use Latin abbreviations to denote how often the dog should receive the antibiotic during the day:
- SID: Once a day dosing
- BID: Twice a day dosing
- TID: Three times a day dosing
- QID: Four times a day dosing

Penicillin Injectable is administered by the intramuscular route. The product is ready for injection after warming the vial to room temperature and shaking to ensure a uniform suspension. The daily dose of penicillin is **3,000 units** per pound of body weight (1 mL per 100 lbs body weight). Continue daily treatment until recovery is apparent and for at least one day after symptoms disappear, usually in two to three days. Treatment should not exceed four consecutive days. No more than 10 mL should be injected at any one site. Rotate injection sites for each succeeding treatment. Penicillin Injectable (Aqueous Suspension 300,000 u) contains 300,000 units procaine penicillin G per ml. For use in cattle, swine, sheep and horses. Penicillin Injectable is used in the treatment of diseases sensitive to penicillin, such as bacterial pneumonia, foot rot, pneumonia, and wound infections.

- Administer 1 ml. IM per 100 lbs. body weight.
- Inject daily until recovery is apparent and for at least one day after symptoms disappear, usually in two to three days.
- 48 hour milk withdrawal
- 1lbs = 0.45359237kg

Needle use and handling

General Guidelines

- Select a clean injection site.
- Single-use needles are preferred.
- Keep the contents of the vaccine bottle sterile; do not store a syringe and needle in the top of a bottle.
- Do not put a needle back into the vaccine bottle once it has been used for anything else.
- Keep transfer needles in a closed container when at chute-side and after use, boil and place in a clean container

Selecting the proper needle gauge

Primary considerations in needle selection include route of administration, size of the animal, and site of the injection. Secondary considerations include viscosity of the fluid

and volume injected. The needle size used should never be larger than necessary to adequately perform the injection

Changing Needles

- Change needles every 10 to 15 head, or with every automatic dosing syringe refill.
- Change any needle that is bent, or becomes contaminated (manure, dirt, or chemicals), or if the needle point becomes burred.
- To prevent the spread of known blood-borne infectious diseases, use a new needle for each animal. Note: A broken needle is an emergency; it will migrate farther into the tissues. Under no circumstances should animals with broken needles be sold or sent to a packer.

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. A dosage refers to a specified amount of medication taken at one time.
2. Dose is the prescribed administration of a specific amount, number, and frequency of doses over a specific period of time.

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

1. Drug dosage forms can be classified based on:
   A. Site of Application
   B. Route of drug administration
   C. Uses
   D. Physical state of the drug
   E. All of the above
2. Which one of the following dosage form is semisolid dosage?
   A. Granules
   B. Capsules
   C. Emulsions
   D. Ointments

Test III. Short Answer Questions (10 point)

The Clinician undergoes clinical examination and prescribed the Oxytetracycline 10%. The heifer weighs 150 kg and requires a daily injection of 10% drug in solution at the 10 mg / kg dose rate. Calculate the volume of the dose to be administered for Cow.

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

You can ask your teacher for the copy of correct answers

4.1 Giving treatment and assessing its effects

Chemotherapeutic agents

When an animal is treated with chemotherapeutic agent, there are 3 interacting aspects: The host animal, the pathogen and the drug. This relation-ship is called the chemotherapeutic triangle. Chemotherapeutic agent includes the following

a. **Antibacterial (antibiotics) drugs.** They are drugs that kill or inhibits the growth of bacteria
b. **Antifungal drugs** are drugs that kill fungus.
c. **Antiprotozoal drugs** are drugs that kill protozoa.
d. **Anthelminthic** are drugs that kill /inhibit helminth parasites.
e. **Acaricide** are drugs that kill ticks, lice, fleas and mite (Acarine)
f. **Insecticides:** are drugs that kill insects.

Pharmacokinetics and Pharmacodynamics of the drug

a. Pharmacokinetcis

Pharmacokinetis: the study of movement of drug in the body including the process of absorption, distribution, accumulation in the site of action, biotransformation (metabolism) and excretion of drug. It deals with what the body does to the drugs.

1. Absorption of drug: - is the movement of drug from its site of administration into the blood stream across biological membranes to reach on its site of desired action. Thus except when given IV and local application, The drug has to be absorbed/cross biological membranes. The rate of absorption can be influenced by; route of administration, physico-chemical and Pharmacological properties of the drug, area and vascularity of absorbing surface/site

2. Distribution of drugs in the body: - The dispersion of drugs from blood stream to all parts of the body which ends with penetration in to the site of action. is known as **distribution.**

3. Accumulation of drug :Means the tendency of the drug to concentrate/ accumulate at the desired site of action.

4. Biotransformation (metabolism) of drug: The various enzymatically mediated chemical changes, which undergo in the body before final elimination from the body is collectively known as metabolism/biotransformation. These changes usually result in redaction in the toxicity of the administered drug andbecause of this it is called detoxification. drug metabolism is mainly carried out by liver because the enzymes carrying out drug metabolismt are abundant in the liver.Repeated administration of drug can result in drug tolerance, because of a diminishing response of microsomal activity of the liver.

5. Drugs excretion from the body:

Drugs are eliminated from the body via several routes and the principal organs of excretion are kidneys but liver lungs and GIT are also important in drug excretion. Milk, saliva and sweat are less important in excretion. These processes follow two pathways. Kidneys eliminate drugs in the form of urine; Liver eliminates metabolized drugs through bile;Git through faces where as volatile drugs are excreted through the lungs. In general drug can be excreted from the body with different fluids/secretions like milk, saliva and sweats.

b) Pharmacodynamics: studies the effect of drugs on the body cells and systems and their mechanism of action (MOA).

Mechanism of action of drug: This describes the action of the drug on the agent causing disease. It can directly kill the causative agent. Eg in case of bactriocidal drugs or it can inhibit/ suppress the multiplication and proliferation of the causative agent .eg in case of bactriostatic drugs. All drugs are capable of producing adverse effects, following administration, which can be :-

1. **Predictable effect:** means effect of the drug which is expected to occur .this is the problem of the drud on the patient. This includes Side effect, secondary effect, toxic effect and drug intolerance.

2. **Side effect:** -unwanted but unavoidable pharmacodynamic effects, that occur at therapeutic doses.eg Asprine is antinflamatory (pain killer) drug but induces gastritis. Gastritis is the side effect of asprine. Which is unwanted and unavoidable.
3. **Secondary effect-indirect consequence** of primary action of the drug .e.g.- suppression of bacterial microflora by oxy tetracycline which leads in to supper infections.
4. **Drug intolerance-** the appearance of characterstic toxic effects of a drug in an individual at therapeutic dose. This indicates the low threshold of the individual to the action of a drug.
5. **Unpredictable (type 2) reactions.** These are based on peculiarity or problem of the patient and not on drugs known actions,
6. **Drug allergy/hypersensitivity:** they are more serious and often require withdrawal of the drug. Drug allergy is immunologically mediated reaction where the drug acts as an antigen then the patient produces antibody against the antigen.. For this reaction a prior sensitization (hyper sensitivity test) is needed through intra dermal route

4.2 Basic concepts of toxicology

Toxicology: is the study of how natural or man-made poisons cause undesirable effects in living organisms. Toxicology addresses a variety of questions. For example, in agriculture, toxicology determines the possible health effects from exposure to pesticides or herbicides, or the effect of animal feed additives, such as growth factors, on people. Toxicology is also used in laboratory experiments on animals to establish dose-response relationships. Toxicology also deals with the way chemicals and waste products affect the health of an individual.

Ensure treating animals safely

Livestock producers must ensure veterinary drugs are only used when necessary, that animals get an effective course of treatment, and there is minimal risk of adverse side effects including carcass residues or physical contaminants.

For veterinary treatments:

- Only allow people who are trained and/or competent to administer animal treatments.
- Follow the directions on the label or from the vet and only use approved veterinary chemicals.
- Store chemicals according to instructions on the label and keep them in a place safe from animals.
- Make sure all equipment is working correctly and calibrated before use
- Have management systems in place to prevent cross-contamination between treated and non-treated animals.
- Administer veterinary chemical injections in the neck (unless site specific) and minimise damage to the site.
- Record livestock treatments, including adverse reactions, and pass this on when selling stock.

4.3 The common veterinary drugs

4.3.1 Anthelmintic

Anthelmintic are drugs that are used to treat infections with parasitic worms. This includes both flat worms (flukes whipworms, hookworms, pinworms, threadworms, and filarial worms). Anthelmintic can be classified into the following based on their mode of action: Nicotin agonist, acetyl cholinesterase inhibitor, GABA agonist, Glucopotentiator, calcium permeability increase, B-tubulin binding, proton ionophores, inhibitor of malate metabolism, inhibitor of phosphoglycerate kinase and mutase, and inhibitor of arachidonic acid. Base on spectrum of action, anthelmintic can be classified as: broad spectrum (kill a wide variety of worms) or narrow spectrum (kill one or two varieties).

Benzimidazole (albendazole, cabendazole, fenbendazole, flubendazole, mebendazole, oxfendazole, oxibendazole, parbendazole and triclabendazole).

Mechanism of action: The benzimidazole bind to a specific building block called beta tubulin and prevent its incorporation into certain cellular structures called microbutbules,

which are essential for energy metabolism. Then parasite will die or paralyzed from action of benzimidazole drugs.

It is broad spectrum in treatment of all nematode, cestode and adult form of fasciola. Triclabendazole is narrow spectrum for faciolosis, and also broad spectrum for fasciola species, which means it can kill all stages of fascioala (larva and adult stage).However, it is not recommended for pregnant animals due to its teratogenic effect.

Imidazothiazoles: (tetramisole, levamisole): it is broad spectrum againist nematodes.

Mechanism of action: Levamisole is selectively as a cholinergic agonist at synaptic and extra synaptic nicotinic acetylcholine receptors on nematode muscle cells. This cause spastic paralysis of susceptible nematode by selecting gating acetylene receptore ion channels on nerve muscle. Levamisole is a nematodicidal compound effective against lung and GI tract nematodes and annelid (leech) but not effective against cestode and trematode parasites, and it is not ovicidal. Levamisole have been shown to have immune modulatory effects, that is; it enhances immune responsiveness by restoring the number of T lymphocytes to normal when they are depleted. It is not used in horse because of its limited efficacy against many equine parasites.

Tetrahydropyrimidines: (pyrantel, morantel and oxantel):

Mechanism of action: These drugs act selectively as agonist at synaptic and post synaptic nicotinic acetylcholine receptors on nematode muscle cells and produce contraction and spastic paralysis. Pyrantel and morantel are 100 times more potent than acetylcholine, although slower in initiating contraction

Piperazine (Diethylenediamine): The drug has good efficacy profiles against ascarid and nodular worm infections of all species of domestic animals, moderate for pinworm infections.

Mechanism of action: Piperazine acts by blocking transmission by hyperpolarizing nerve membranes at the neuromuscular junction leading to parasite immobilization by flaccid paralysis and consequent removal from predilection site and death. Piperazine is

a selective agonist of gamma-amino butyric acid (GABA) receptor resulting in opening of chloride channels and hyperpolarization of the membrane of the muscle cells of the nematode parasites. Mature worms are more susceptible to the action of piperazine than the younger stages.

Bunamide: It is effective against the common tapeworm species and it is most effective when given after fasting. It is formulated as tablets (hydrochloride salt) or suspension (hydroxynaftoate salt) for oral administration in companion animals and ruminants, respectively.

Mechanism of action: It acts by disrupting the tapeworm`s tegument and reduces glucose intake, as a result, the subtegumental tissues are exposed and the worm destroyed by the host`s digestive enzymes.

Praziquatel: its mode of action is by increasing the cestode's cell membrane permeability; this disintegrates the worm's outer tissue covering.

Macrocyclic Lactones (abamectin, ivermectin, doramectin, eprinomectin, and selamectin):

Mechanism of action: The macrolides act through selective toxic effects on insects, acarines, and nematodes. However, they do not possess efficacy against cestode and trematode parasites due to both trematode and cestode they have not recetor for this ivermectin or lack of GABA receptor. The macrocyclic lactones induce reduction in motor activity and paralysis in both arthropods and nematodes. The parasitic effects are mediated through GABA and/or glutamate-gatedchloride channels (GluCl), collectively known as ligand-gated chloride channels. The endectocides cause paralysis and death of both arthropod and nematode parasites due to their paralytic effects on the pharyngeal pump which affects nutrient ingestion, and on the parasite somatic musculature limiting its ability to remain at the site of predilection in the host.

4.3.2 Anti-microbial

Antimicrobial therapy is based on the selective toxicity of a drug for invading organisms that is the ability to kill or inhibit an invading microorganism without harming the cells of the host. Antimicrobial can be classified into different based on their action, they are like:

- **Inhibition of cell wall synthesis:** Penicillins, cephalosporins.
- **Impairment of cell membrane function:** Polymyxin, tyrocidin, and the polyene antifungal agents, nystatin and amphotericin B that bind to cell-wall sterols.
- **Reversible inhibition of protein synthesis:** Affect the function of 30s or 50s ribosomal subunits, and are bacteriostatic drugs which include chloramphenicol, tetracyclines, macrolides (erythromycin) and clindamycin.
- **Alteration of protein synthesis:** Bind to the 30s ribosomal subunit and affect cell membrane permeability which eventually leads to cell death, eg aminoglycosides (eg; streptomycin, gentamicin).
- **Inhibition of nucleic acid function or synthesis:** Rifamycins (rifampin) which inhibit DNA-dependent RNA polymerase, and quinolones (oxolinic acid).
- **Interference with microbial metabolism:** Sulphonamides, trimethoprim.
- **Inhibition of viral enzymes**: These agents block the viral enzymes that are essential to DNA synthesis, thus halting viral replication, eg nucleic acid analogues (zidovudine, acyclovir, and vidarabine).

The most common bacteriocidal (kill bacteria) antimicrobials are like: Agents that alter microbial cell wall or membrane permeability are **generally bactericidal**. These include the penicillins, cephalosporins, aminoglycosides and polymyxins. Essentially bacteriostatic agents inhibit bacterial protein synthesis, chloramphenicol, macrolides and tetracyclines.

The importance of combination of two or more antimicrobial drugs useful in veterinary medicine, the importances of combining are:

- To overcome infection

- To avoid rapid emergence of resistant mutants, especially in prolonged therapy with drugs such as streptomycin which tend to induce rapid bacterial resistance
- To prevent inactivation of the antimicrobial agent by bacterial enzymes, eg, the use of co-amoxiclav, a combination of amoxycillin and clavulanic acid, an lactamase inhibitor
- To achieve a synergistic effect, as is exemplifi ed by cotrimazine, a combination of sulphadiazine and trimethoprim
- To reduce the severity or incidence of adverse reactions where the organisms are fully sensitive to each drug.

Common veterinary antimicrobials

Penicillins (procaine penicillin, penicillin G): It is betalactames Penicillins which interfere with the synthesis of the bacterial cell wall peptidoglycan (the major constituent of G+ve bacteria cell wall). After attachment to binding sites on bacteria, they inhibit the trans peptidase enzyme involved in cross linking of the peptidoglycan chain, the 3rd and final stage of bacterial cell wall synthesis. It is narrow against G+ve aerobes and anaerobes bacteria.

Side effects and toxicity: Hypersensitivity reactions: Like other antibiotics penciline drugs have side effects but in case of toxicity they are safe. However the main problem of this drug is it causes hypersensitivity

Drug withdrawal and milk discard times: For withdrawal times for food animals and milk discard times must be allowed according to the instructions.

Cephalosporins: It is beta lactamase group, which have certain therapeutic advantages over penicillins which include their relative resistance to lactamase, their broad-spectrum of activity, their ability to reach the CNS, and less likelihood to cause allergic reactions, hence they are suitable for use in rabbits, guinea pigs, and reptiles. They inhibit the lactam binding proteins involved in bacterial cell wall peptidoglycan synthesis, hence are bactericidal. Cephalosporin have four generation, they are like:

- **First-generation cephalosporins:** cefadroxil, cephalexin, cefazolin, cephacetril, cephradine and cephaxazole)
- **Second-generation cephalosporins:** cefaclor, cefamadole, cefmetazole, cefonicid, ceproxil, and loracarbef. Cephamycin; cefotetan and cefoxitin.
- **Third-generation cephalosporins:** cefdinir, cefixime, cefoperazone, cefotaxime, ceftizoxime, and ceftriaxone.
- **Fourth-generation cephalosporins:** Examples are cefepime and cefpirome. They have a wide antibacterial spectrum (Enterobacter, Escherichia, Klebsiella, Proteus, and Pseudomonas). Cefepime is highly resistant to lactamases

Aminoglycosides (streptomycin, dihydrostreptomycin, neomycin, tobramycin, kanamycin, gentamicin, amikacin, netilmicin): They bind to the 30S ribosome and inhibit the rate of bacterial protein synthesis and the functionality of Mrna translation, resulting in the synthesis of abnormal proteins. Aminoglycosides alter cell membrane permeability causing nonspecific membrane toxicity. Their effect is bactericidal and is enhanced by agents that interfere with cell wall synthesis (eg, -lactam antibiotics). They are effective against many aerobic G-ve and some G+ve organisms; Leptospira spp are also affected.

Side effect: - Ototoxicity, neuromuscular blockage, nephrotoxicity are most frequent toxic reactions Nephrotoxicity has symptoms of poly urea decreased urine Osmolality, protein urea, enzyme urea.

Tetracycline (Tetracycline, oxytetracycline, demeclocycline, doxycycline, methacycline, and minocycline): Tetracyclines are bacteriostatic; they inhibit microbial protein synthesis by binding to 30S ribosome and block the attachment of aminoacyl tRNA to the mRNA-ribosome complex. As a result, they block the addition of amino acids to the growing peptide chain. It is broad spectrum against G+ve and G-ve bacteria, spirochaetes, rickettsiae (Anaplasma, Cowdria, and Ehrlichia species), mycoplasmae, chlamydiae, amoebae, and some protozoa (Theileria and Babesia species).

Strangles in horses; actinomycosis and actinobacillosis; anthrax; pasteurellosis; clostridial diseases; respiratory and urinary tract infections in dogs and cats; psittacosis in birds, rickettsial diseases; bovine anaplasmosis, caprine heartwater, canine ehrlichiosis, mycoplasma infections of poultry including borreliosis, coryza and erysipelas all respond to tetracycline therapy.

Side effects and toxicity: they cause renal toxicity and hepatotoxicity. High dose administered orally to ruminants will seriously disrupt micro floral

Chloramphenicol: Chloramphenicol binds with the 50 s ribosomal subunit to inhibit peptide bond formation and protein synthesis in the bacterial or disease causing organism. It is a broad-spectrum bacteriostatic agent active against many gram-positive and gram-negative bacteria, Rickettsia, Mycoplasmas, and Chylamydia. It has an excellent therapeutic activity against Salmonella.

Side effect and toxicity: Causes hemotoxicosis in the case of high doses

Macrolide (oleandomycin, tylosin, carbomycin, spiramycin, tiamulin, tilmicosin): It inhibits bacterial protein synthesis by binding to the 50s ribosome, preventing translocation of amino acids to the growing peptide. It is effective against gram positive organisms such as staphylococci, mycoplasma, spirochaetes, and certain mycobacteria are sensitive to the group.

Lincosamide: They are effective against gram-positive cocci, anareroes, and Toxoplasma and mycoplasma species.

Sulphonamides: It is broad spectrum antimicrobial drugs which inhibit bacteria and protozoa (coccidiosis). Long acting (sulphamethoxypyridazine, sulphamethoxine, sulphadoxine). Enteric or gut-activesulphonamides (Phythalylsulphathiazole, Succinyl sulphathiazole, Sulpha-bromethazine, Sulphaquinoxaline, Sulsalazine, Sulphacetamide). Being impermeable to folic acid, many bacteria must rely on their ability to synthesis folate from PABA. Pteridine and glutamate in contrast the mammalian in cells cannot synthesize folic acid and must obtain preformed folate as a

vitamin in their diet. The sulphonamides are structurally similar to PABA, the sulphonamides competitively inhibit dihydropteroate syntheses, the enzyme that catalyses the incorporation of PABA into dihydrofolic acid.

The folic acid is required for pure and D.N.A synthesis which without it bacteria growth is inhibited. Sulphonamides have a broad- spectrum of activity against both gram-positive and gram negative bacteria, and some protozoa (coccidia, Neospora, Toxoplasm), riicketsiae.

Side effects and toxicity: hypersensitivity or direct toxic effects. Acute toxic reactions following rapid IV administration or due to excess dose injection could occur clinical signs include muscle weakness blindness ataxia, and collapse gastro intestinal disturbance could also occur.

4.3.3 Antifungal drugs

Fungal infections (mycoses) are classified into two types: topical (superficial), which affects the skin and mucous membranes, and systemic which affect areas as the blood, lungs, or C.N.S. The most common disease of fungas in domestic animals are raised from the strain of fungas like: Blastomycosis,

- Cryptococcosis, Histoplasmosis (epizootic lymphangitis) and
- Coccidioidomycosis. The most common drug available for treatment of fungal infections are like:
- Superficial agents (griseofulvin)Polyene macrolides (amphotericin B, nystatin)
- Imidazole derivatives (ketaconazole (the prototype), miconazole, clotrimazole, Fluconazole, itraconazole, enilconazole, and terconazole)
- Antimetabolites (5-flucytosine)

4.3.4 Antiprotozoals drugs

Anticoccidiosis: Sulphonamides, Quinazolines, Quinolones, Symmetrical triazinones and Thiamine antagonists

Antitypanosomiasis: Diamidines (Diminazene aceturate, Phenamidine, Stilbamidine and Pentamidine), Phenanthridines (phenidium, dimidium, homidium and isometamidium), Quinapyramine Compounds (quinapyramine chloride, quinapyramine sulphate and suramin), Organic arsenicals (melarsomin, or melarsoprol)

Antipiroplasmosis (amicarbalide isethionate, buparvquone, halfuginone, menoctone, parvaquone tetracycline, imidocarb, quinuronium sulphate). It can inhibit anaplasma like: anaplasmosis, babesiosis, cowdriosis, theileriosis, ehrlichriosis, and hepatozoonosis and in avian spirochaetosis.

4.3.5 Acaricide

Insecticides are any substance or a mixture of substances intended to prevent, destroy, repel, or mitigate insects. Similarly, acaricides are substances that can destroy mites. A chemical can exert both insecticidal and acaricidal effects. Based on their properties, these chemicals can be classified into four groups:

- Organophosphates,
- Carbamates,
- Organochlorines, and
- Pyrethrins and pyrethroids.

Because of worldwide use, these chemicals pose health risks to non-target species, including people, domestic and companion animals, wildlife, and aquatic species. In large animals, poisoning is often due to inadvertent or accidental use, whereas in small animals (particularly dogs) poisoning is often due to malicious intent.

Pesticide labels must carry warnings against use on unapproved species or under untested circumstances. These warnings may pertain to acute or chronic toxicity, or to

residues in meat, milk, or other animal products. Because labels change to meet current government regulations, it is important to always read and follow all label directions accompanying the product.

Each exposure, no matter how brief or small, results in some of the compound being absorbed and perhaps stored. Repeated short exposures may eventually result in intoxication because of cumulative effect. Every precaution should be taken to minimize human exposure. This may include frequent changes of clothing with bathing at each change, or if necessary, the use of respirators, rain gear, and gloves impervious to pesticides. Respirators must have filters approved for the type of insecticide being used (eg, ordinary dust filters will not protect the operator from organophosphorus insecticide fumes). Such measures are generally sufficient to guard against intoxication. Overexposure to chlorinated hydrocarbon insecticides is difficult to measure except by the occurrence of overt signs of poisoning.

Organophosphate and carbamate insecticides produce their toxicity by inactivation of acetylcholinesterase (AChE) enzyme at the synapses in nervous tissue and neuromuscular junctions, and in RBCs. Therefore, the cholinesterase-inhibiting property of organophosphates or carbamates may be used to indicate degree of exposure if the activity of the blood/RBC-AChE is determined during an early period of exposure.

Organic pesticides are known to exert deleterious effects on fish and wildlife as well as on domestic species. In no event should amounts greater than those specifically recommended be used, and maximal precautions should be taken to prevent drift or drainage to adjoining fields, pastures, ponds, streams, or other premises outside the treatment area. An ideal insecticide or acaricide should be efficacious without risk to livestock or persons making the application and without leaving residues in tissues, eggs, or milk. Only a few compounds may meet all these requirements.

Non-steroidal anti-inflammatory drugs (NSAIDS)

Non-steroidal anti-inflammatory drugs (NSAIDs) are among the most important drugs used in all species of animals. They possess both analgesic and anti-inflammatory properties. Pharmacokinetic parameter estimates for NSAIDs can be examined using the available data from research reports and the drug package inserts. Among the adverse reactions caused by NSAIDs, gastrointestinal problems are the most frequent reason to discontinue NSAID therapy or consider alternative treatment. In the kidney, prostaglandins play an important role in modulating the tone of blood vessels and regulating salt and water balance.

Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) are used to control the pain and inflammation associated with osteoarthritis. Inflammation - the body's response to irritation or injury - is characterized by redness, warmth, swelling, and pain. NSAIDs work by blocking the production of prostaglandins, the body chemicals that cause inflammation. In veterinary medicine, approved veterinary NSAIDs are used to control the pain of osteoarthritis in dogs and some veterinary NSAIDs are approved for the control of postoperative pain in dogs. However, there are risks and benefits with all commonly prescribed veterinary drugs, including NSAIDs. Pet owners should be aware of the following facts:

Generally, the classification NSAID is applied to drugs that inhibit one or more steps in the metabolism of arachidonic acid (AA). Unlike corticosteroids, which inhibit numerous pathways, NSAIDs act primarily to reduce the biosynthesis of prostaglandins by inhibiting cyclooxygenase (COX). In general, NSAIDs do not inhibit the formation of 5-lipoxygenase (5-LOX) and hence leukotriene, or the formation of other inflammatory mediators. The novel NSAID tepoxalin is an exception in that it inhibits both COX and 5-LOX. Non-steroidal anti-inflammatory drugs which inhibit COX-1 can reduce thromboxane (TXA2) synthesis in platelets and decrease platelet function. Flunixin meglumine is the most commonly utilized injectable NSAID for acute soft tissue injury, endotoxemia, and abdominal pain. There are veterinary generic formulations of

popular drugs and there are some human-labeled drugs that are used off label (e.g., aspirin, naproxen, and piroxicam).

Examples of non-steroidal anti-inflammatory drugs

- Acetaminophen
- Phenylbutazone
- Meclofenamic acid
- olfenamic acid
- Aspirin
- Flunixin
- Carprofen
- Ketoprofen

Drug withdrawal period

Withdrawal period refers to the minimum period of time from administering the last dose of medication and the production of meat or other animal-derived products for food. For example, if mastitis is treated with a medicine that requires a withdrawal period of 6 days for milk, the treated cow's milk may be produced for delivery to a dairy on the 7th day after the last dose, at the earliest. The purpose of the withdrawal periods is to ensure that foods do not contain residues of pharmacologically active substances in excess of the maximum residue limit (MRL). To determine withdrawal periods, data on the drug metabolism in the animal is studied. The results of residue studies on a veterinary medicinal product are then compared with the MRL. The withdrawal period is set so that it is long enough to ensure that medicinal residues in the animal's tissues are below the maximum limit.

The withdrawal period is different for each veterinary medicinal product, animal species and food type, meaning there are different withdrawal periods for meat (slaughter), fish, eggs, milk and honey. Every federally approved drug or animal health product has a withdrawal period printed on the product label or package insert. Products carry meat withdrawal periods ranging from 0 to 60 days. Examples for meat range from no withdrawal period with ceftiofur, 4-15 days with different penicillin products, to 28 days with Pirlimycin. Animals treated with a product that has a withdrawal period of 45 days should be withheld from sale or slaughter for at least 45 days.

Withdrawal times are not the same for all drugs. Examples for milk include: Pirlimycin, 36 hours; Cloxacillin, 48 Hours, Amoxicillin, 60 hours, Penicillin, 72 hours, and Cephapirin, 96 hours. Milk produced during that period must be disposed of. Dairy animals to be slaughtered must be withheld for the meat withdrawal period specified. Withdrawal periods may be extended when combinations of drugs are used or when drugs are used in an extra-label manner. In these situations or at any time a producer is uncertain of a specific drug withdrawal period, a veterinarian should be consulted.

4.4 Vaccination and assessment of its adverse effect

Vaccine: Is preparation containing either killed or weakened live microorganisms or their toxins, introduced in to the human /animal body to stimulate the production of specific antibodies against an infectious agent.

- Develop active immunity.
- Vaccines can be prophylactic (to prevent the effects of future infection), or therapeutic (E.g. Vaccines against cancer).

Benefits of vaccination

The primary benefit of vaccination is the decrease in the number of animals becoming infected with and dying from infections. When many animals are vaccinated, this “herd effect” has benefit for the vaccinated animals, which are unlikely to become ill from a disease for which they have been vaccinated, and for all animals in the population, who are less likely to be exposed to the disease.

4.5 Types of vaccines

1. Inactivated/Killed vaccines

Produced by inactivation of the infectious agents (so that it can’t replicate in the host).Generally they require two doses with an appropriate interval. These vaccines contain adjuvants that enhance the immune reaction. Adjuvants are substances that added to vaccines especially vaccines with poor immunogenicity (killed vaccines) and enhance the normal immune response of the body of the host to the vaccine. E.g. Aluminium hydroxide, Aluminium phosphate, Aluminium potassium sulfate (Alum) and saponin. They are killed (inactivated) by formalin.

Disadvantages- Induce short lived immunity and need excess antigen.

2. Live /attenuated vaccines

Prepared either by using less virulent or by attenuating highly virulent type of an infectious agent in field isolates of a disease causing agent. They confer high level and longer period of protection than killed vaccines. By attenuation (modified by passage through laboratory animals and culture media) to select an isolate of reduced virulence.

Advantage

- Can be delivered by a number of routes
- Confer relatively long life immunity
- Comparatively in expensive

Dis advantages

- May cause disease in Immunocompromised animals
- Chance of reversion to virulence

Criteria to be considered before vaccination

- Diseases prevalence
- Immune status of the animals
- The level of maternal antibodies
- Season of outbreak
- Economics of vaccine, labor and equipment
- Type, composition, precaution, dose and expiry date of the product
- The general health status of the herd/flock and the local pattern of the disease I.e. vaccinate only healthy animals

Booster vaccination

- Needs to be given at intervals to insure immunological memory for a rapid immune response to pathogens.
- The time may vary depending on whether the vaccine is inactivated or living. Therefore for most killed vaccines yearly revaccination is recommended, except for some diseases which have seasonal incidence vaccination should be planned for a time prior to the expected disease outbreak.

- The interval between vaccine doses depends on an animal's immunologic memory. The duration of this memory depends on multiple factors, such as the
  - ✓ Nature of the antigen,
  - ✓ The use of live or dead organisms,
  - ✓ The adjuvants used, and
  - ✓ The route of administration.

Some vaccines may induce immunity that persists for an animal's lifetime. Other vaccines may require boosting only once every 2–3 years. Even killed viral vaccines may protect some animals against disease for many years. Unfortunately, the minimal duration of immunity has rarely been reliably measured.

Individual animal and vaccine variability make it difficult to estimate the duration of protective immunity. Within a group of animals, there may be a great difference between the shortest and longest duration of protection. Vaccines may differ significantly in their composition, and although all may induce immunity in the short term, it cannot be assumed that they confer equal long-term immunity. A significant difference likely exists between the minimal level of immunity required to protect most animals and the level of immunity required to ensure protection of all animals.

Age at vaccination

- The main obstacle to successful vaccination in young animals is the presence of blocking levels of maternally derived antibody, therefore, all vaccination schemes, whether they are for an individual animal or for a herd health vaccination program must be planned considering the presence and extent of maternal antibody.
- Newborn animals are passively protected by maternal antibodies and, in general, cannot be vaccinated until maternal immunity has waned. If stimulation of immunity is deemed necessary at this stage, the mother may be vaccinated during late pregnancy, timing the doses so that peak antibody levels are reached at the time of colostrum formation.

Recommended ages are:

- Puppies and kittens 6-8 weeks
- Pigs 4-6 weeks
- Cattle ,sheep and goats 6-8 months

Adverse effects of vaccination

A veterinarian should always assess the relative risks and benefits to an animal when determining the frequency of revaccination. Owners should be made aware that protection can be maintained reliably only when vaccines are used in accordance with the protocol approved by vaccine licensing authorities. Some vaccine adverse effects are listed below:

- Pain
- Hypersensitivity/allergic reaction
- Local reaction at the site of inoculation
- Systemic reaction (fever, in appetence, drop in milk yield, shivering, salivation and etc.)
- Residual virulence/reversion to virulence
- Post-vaccinal shedding and persistence of organisms while animals incubate the disease.

Table 6. Vaccines prepared and used in Ethiopia

Name of Vaccine	Route	Dose	Immunity	Booster	Side effect	Precaution	storage	Withdrawal period	Type	Age at vaccination
Anthrax	S/Cut	1ml/cattle and equines, and 0.5/sheep and goats	Develops in 10 days and lasts for one year	Annually (every year)	Swelling at injection site, disappeared	Not given for pregnant, dispose empty bottles	4ºc in refrigerator to-20 ºc	6 weeks from meat after vaccination	Live(freeze-dried)	3 months and above
Bovine Pasturellosis	S/Cut	2ml / cattle	Develops in 10 days and lasts for 6 to 8 months	After 6 months	Swelling and anaphylactic reaction at injection site, disappeared	Shake vigorously before use Avoid light and heat	At room temperature	-	killed	6 months and above
Blackleg	S/Cut	2ml / cattle	Develops in 10 days and lasts for one year	Annually (every year)	-	Shake vigorously before use Avoid light and heat	At room temperature	-	killed	6 months and above
CBPP	S/Cut	1ml / cattle	Develops 3 weeks post vaccination and lasts for one year	Annually (every year)	Mild Swelling at injection site and disappeared	Avoid light and heat	-20 ºc to 4 ºc in refrigerator	-	Live (freeze-dried)	6 months and above
CCPP	S/Cut	1ml / Goat	Develops 2 weeks vaccination and lasts for one year	Annually (every year)	Slight edematous swelling by adjuvants and disappear	Shake vigorously before use Avoid light and heat	At room temperature or at 4ºc	-	Killed	3 months and above
Ovine Pasturellosis	S/Cut	1ml /sheep	Develops in 10 days and lasts for 6 to 8	After 6 months	-	Shake vigorously before use Avoid light and	At room temperature or at 4ºc	-	killed	3 months and above

			months			heat				
L.S.D	S/Cut	1ml / cattle	8 days after vaccination and lasts for one year	Annually (every year)	-	Avoid light and heat	Stored at -20 ºc	-	live(freeze -dried)	6 months and above
F.M.D	S/Cut	4ml / cattle	2-3 weeks after vaccination and lasts for one year	Annually (every year)	Mild Swelling at injection site and disappeared	Shake vigorously before use Avoid light and heat, ,not given with other vaccines	at 4ºc	-	Killed(triva lent) A,O and sat 2	6 months and above
P.P.R	S/Cut	1ml / sheep and Goat	8 days after vaccination and lasts for 3 years(lifelong)	3 years	Mild Swelling at injection site and disappeared	Avoid light and heat,,	Stored at -20 ºc	-	Live (freeze-dried)	6 months and above
Rinderpest	S/Cut	1ml / cattle	8 days after vaccination and lasts for 1 year	Annually (every year	Mild Swelling at injection site and disappeared	Avoid light and heat	Stored at -20 ºc	-	live(freeze -dried)	6 months and above
Sheep and goat pox	S/Cut	1ml / sheep and Goat	8 days after vaccination and lasts for 1 year	Annually (every year	Mild Swelling at injection site and disappeared	Avoid light and heat	Stored at -20 ºc	-	live(freeze -dried)	6 months and above
A.H.S	S/Cut	1ml /equines	Appear 2 weeks after vaccination and lasts for 1 year	Annually (every year	Mild Swelling at injection site and disappeared	Avoid light and heat Rest for 15 days	at 4ºc,not freezed	-	live(freeze -dried)	6 months and above

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. The macrolides drugs act through selective toxic effects on insects, acarines, and nematodes.
2. Netilmicin is bind to the 30S ribosome and inhibit the rate of bacterial protein synthesis and the functionality of Mrna translation, resulting in the synthesis of abnormal proteins.
3. Betalactames Oxytetracline are interfere with the synthesis of the bacterial cell wall peptidoglycan (the major constituent of G+ve bacteria cell wall).

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

1. The duration of animal's immunologic memory depends on:
   A. Nature of the antigen,
   B. The use of live or dead organisms,
   C. The adjuvants used, and
   D. The route of administration. E. All of the above

Test III. Short Answer Questions (5 point each)

1. **Write the mechanism of action for the following listed drugs.**
   A. Penicilline
   B. Oxytetracycline
   C. Albendazole
   D. Tylosin
2. Discuss adverse effect of vaccination.

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

You can ask your teacher for the copy of correct answers

Information Sheet 5- Administering fluid therapy for controlling metabolic diseases

5.1 Introduction

The healthy body contains between 60% and 70% water, which is found inside and surrounding all the cells. This fluid maintains a balanced state within the body so that the normal metabolic processes can function efficiently a process known as homeostasis. Dissolved in the body fluids are chemical materials that are essential for the body's metabolism and which play a part in controlling the movement of fluid around the body. Many medical conditions and surgical procedures cause an upset in fluid balance and if nothing is done to correct this the animal may become severely dehydrated or go into shock and die. The purpose of fluid therapy is to replace any deficit so that the circulating fluid volume is restored and renal function is improved.

There are many types of fluid used in fluid therapy and the fluid replaced must be as close as possible, in terms of the chemical constituents and volume, to that lost from the general circulation.

5.2 Fluid therapy:

Fluid and electrolyte replacement therapy in livestock is needful during negative fluid balance that is when fluid intake is less than the fluid loss from the body and when fluid intake is not enough to meet the metabolic requirements. Fluid therapy in farm and companion animals is important during perioperative period and other disease conditions causing fluid loss. Rehydration, replacement of lost electrolytes, and restoration of acid-base balance are the goals for fluid therapy. Before treating animal, veterinarians should develop the plan for fluid and electrolyte replacement therapy by considering and assessing following important points.

5.3 Volume and rate of fluid administration:

The optimum fluid volume and rate to be administered can be determined by considering replacement of hydration deficit, calculation of maintenance fluid needs, replacement of ongoing losses and also determination of plasma protein concentration.

The volume required for hydration replacement can be calculated as below.

Fluid requirement in liters to replace hydration deficit = (estimated % dehydration) X (body weight in kg)

Generally, hydration replacement must be done slowly over the period of about 4 hours. Following it, maintenance and ongoing losses administered over the remaining hours in the day. However, in case of hypoproteinemia and particularly in camels, the hydration replacement fluid administration even need to be more slow, with half of the volume replaced in 4 to 6 hours and the remaining should be given over 12 to 24 hours.

Maintenance of fluid requirements account for daily normal water losses pertaining to urination, defecation, respiration, sweat, and other evaporation losses. These losses differ depending on age and physiologic stage of the animal (lactation, pregnancy). Neonates and young animals have higher total body water compare to adults, and thus need higher volume of maintenance fluid. Generally maintenance fluid needs can be estimated as below

- **Adults:** 50 mL/kg/24 hours or 1 mL/lb/h
- **Neonates:** 70 to 80 mL/kg/24 h or 2 mL/lb/h

These numbers can be followed as guide in all the farm animal species However, in situations where fluid rates are difficult to control or disruption of fluid line, replacement fluids may be divided and administered as single bolus every 3 hours by calculating

volume required for 3 hour period. But it may not work in hyper oncotic solutions or parenteral nutrition solutions.

Ongoing losses include loss of fluid, protein, and electrolytes, due to continuing disease process, such as internal hemorrhages, diarrhea or internal or external loss of fluid, etc., it is difficult to quantify these losses if not able to measure directly. Thus ongoing losses are usually determined indirectly by counting appropriate parameters, like

- Packed cell volume (PCV)
- Total plasma protein (TPP)
- Serum electrolyte panel, and
- Body weight may be used to monitor the success of fluid therapy to sustain body fluid, protein, and electrolyte balance.

5.4 Method or route of fluid administration:

Although in farm animals and camels, large volumes of fluids may be administered orally into the rumen enabling effective treatment of mild to moderate dehydration, parenteral administration is more preferred. Particularly in camels, repeated oral fluids may be stressful and may induce cortisol-mediated lipolysis. In general, oral fluid therapy is beneficial to mentally alert, animals with good gastrointestinal motility, and are less than 8% dehydrated. Other cases of animals are best managed with at least initial parenteral fluid resuscitation and correction of acid-base and electrolyte abnormalities.

5.5 Type of fluid:

There are 4 major types of fluids used in clinical medicine, which differ in composition, cost and indications. Apart from two well-known fluids that is blood products and parenteral nutrition; two other fluid types required are Crystalloids and Colloids. Considering their importance in critical and emergency medicine, one or multiple type of fluids are required in many illnesses or disease conditions of animals such as

- Anaemia
- Shock

- Hypoalbuminemia
- Hypoglobulinemia
- Metabolic acidosis
- Metabolic alkalosis
- Hyponatremia
- Hypochloremia
- Hypokalaemia
- Ketosis
- Hypoglycaemia

1 Crystalloid solutions:

In veterinary practice, crystalloid solutions are most commonly used. Generally, crystalloid solutions contain water, electrolytes (in particular Na, Cl), and/or dextrose. Crystalloid solutions may be balanced, resembling composition of extracellular fluid (ECF) for example polyionic solutions like Ringer's solutions, Normosol, Plasma-Lyte, etc., or unbalanced, meant to substitute specific components, for example isotonic saline (0.9% NaCl), 5% Dextrose solution, etc. Further, crystalloid solutions can be isotonic, for example, normal saline (0.9% NaCl); hypertonic which has higher osmolality than plasma, for example 7.2 % NaCl; acidifying solutions which are used in metabolic alkalosis, for example saline or lactated ringer's solution; alkalinizing solutions, for example 1.3% or 5% NaHCO3; Dextrose solutions for treatment of hypoglycaemia, for example 5% dextrose.

2 Colloidal solutions:

A substance with high molecular weight (MW) which mostly retain in the intravascular compartment and thus generates an oncotic pressure is called as colloid. It means oncotic pressure is osmotic pressure generated by high molecular weight compounds in the blood, mostly plasma albumin. These molecules act similar to albumin by maintaining osmotic pressure within the vascular system.

In a healthy animal, colloids persists for longer time in intravascular space compared to crystalloids. But when integrity of capillary membranes altered in certain diseases, colloids may leak out of the vessels.

Generally, colloids are classified into two types; Natural (Plasma albumin) and Synthetic (e.g. gelatin and dextran solutions, hydroxyethyl starch). These colloids possess various

characteristics which determine their behaviour in the intravascular compartment. Despite their higher cost, colloids are more appropriate than crystalloids for use in hypoproteinaemia patients and those requiring longer-term stabilization of cardiac output. In one study of induced haemorrhage and resuscitation in sheep the addition of 6% dextran 70 to 7.2% NaCl resulted in maintenance of a significantly higher cardiac output in comparison with other hypertonic solutions by redistribution of interstitial fluid into the vasculature. Administration of 50 mL/kg hetastarch in over 60 minutes to healthy llamas (a camelid) resulted in significant haemodilution, indicating the ability of hetastarch to expand plasma volume. These effects were greater than those observed after administration of lactated Ringer's solution. Hetastarch also significantly increased plasma colloid osmotic pressure for 96 hours after infusion.

Albumin: is a major natural colloid (MW 69 kDa) contributing mainly to normal oncotic pressure in healthy animal. 5% solution is iso-oncotic and leads to 80% plasma expanding effect initially, which persists for 16-24 hours. Being natural colloid, it is associated with lesser side-effects like pruritus, anaphylactic reactions and coagulation abnormalities compared to synthetic colloids. However, cost-effectiveness and in case of septic shock due to increased vascular leakiness, albumin therapy could aggravate and lead to interstitial oedema.

Dextrans are synthetic colloids and are highly branched polysaccharide molecules, available in 6% solution (MW 70 kDa) and 10% solution (MW 40 kDa). Both solutions exert short duration volume expansion effect for 6-12 hrs and increase microcirculation by increasing haemodilution and inhibiting erythrocyte aggregation. However, its use is very limited due to potential side effects like anaphylactic reactions, coagulation abnormalities, interfere in blood matching, increase of erythrocyte sedimentation rate and even acute renal failure is implicated following its use in kidney damage patients.

Gelatin is high molecular weight protein formed from hydrolysis of collagen. Although earlier colliods had potential side effects of high viscosity and tendency to gel at low temperatures, modified gelatins like succinylated, urea-cross linked and oxypolygelatins are currently in use. Most of these products are low molecular weight, short-lived and

effective for small duration compared to albumin, starch formulations. Apart from this, higher incidence of anaphylactoid reactions, unclear effect on coagulation and circulatory disturbances could limit their uses

Route of administration

Oral rehydration therapy (ORT) can be used to correct mild to moderate dehydration. Orally administered fluids should not be used to correct hypovolemia. Oral administration has the advantage of being the most physiologic route in addition to being economic and safe. Large volumes of nonsterile fluids, electrolytes, drugs, and nutrition can be administered orally. The animal may voluntarily drink the fluids, or an enteral feeding tube can be placed. ORT

Subcutaneous

Isotonic crystalloid solutions can be administered subcutanously to treat mild dehydration in animals with vomiting and diarrhea. Patient selection includes patients that cannot be hospitalized and animals with self-limiting conditions that are likely to benefit from rehydration. Large volumes of fluid can be administered easily at various sites. Solutions must be isotonic, sterile, and nonirritating. Hypertonic and hypotonic crystalloids, colloids, and dextrose containing solutions should not be given subcutanously. Skin necrosis may occur if fluids are given subcutanously to a vasoconstricted, hypovolemic, or immunocompromised patient. Septic necrosis of the skin and abscessation may occur if dextrose-containing fluids are administered.

Intravenous

Intravenous fluid administration should be used to correct hypovolemia and moderate to severe dehydration because it allows precise titration of fluids to meet fluid requirements. Caloric requirements also can be met with parenteral nutrition. Crystalloids (isotonic, hypertonic, and hypotonic), colloids, and blood products all can be administered intravenously. Hyperosmolar solutions should be administered into a central vein.

Intraosseous

Intraosseous access is useful in patients that require rapid fluid and drug administration when intravenous access is not possible. Intravenous catheterization in the hypovolemic puppy or kitten with vomiting and diarrhea may be technically challenging, and provision of isotonic crystalloids and dextrose by means of the intraosseous route may be life-saving.

IV Fluid Therapy Calculations

Figure 17. IV fluid therapy

The basics:

- Maintenance fluid rate for an adult dog or cat is estimated as 2mL/kg/hr or 50mL/kg/24 hours. e.g. 35kg dog:
- Maintenance = 35kg x 2 = 70mL/hour or 50mL x 35kg = 1750mL/24 hours
- Maintenance fluid rate for puppy or kitten may be estimated as 3-4mL/kg/hr

Fluid deficit:

- If present, the fluid deficit needs to be calculated and this can be done by estimating the percentage of dehydration:

  e.g. A 35kg dog that is estimated to be 8% dehydrated

- •Percentage of dehydration is estimated to be 8% of the body weight and then this is converted into fluid units:
- •*e.g.* 35kg x 0.08 = 2.8kg
- •1kg = 1L, therefore the dog has a 2800mL fluid deficit

If the fluid lost is to be replaced over 24 hours, the maintenance requirement is added to the fluid deficit to work out the total amount to be given over a 24 hour period: e.g. 1750mL + 2800mL = 4550mL over 24 hours In a severely dehydrated animal the deficit may be replaced over 24 hours, but at times it may be appropriate to 'front load' e.g. 30% in the first 3 hours, though more of less may be appropriate depending on the case and response to treatment. If a patient is in shock, generally a bolus of fluids will be given over a short period of time rather than increasing the fluid rate so that the fluid deficit is replaced more quickly.

Ongoing losses: Fluid rates must be adjusted according to the ongoing losses such as vomiting, diarrhoea, haemorrhage. The volume of fluid that is being lost should be estimated in each case and then adjusted depending on disease progression and clinical assessment.

Once the overall fluid rate per hour has been calculated, taking into consideration maintenance, deficit and on-going loss, this information can be entered into an infusion pump if this is available. If not a drip rate needs to be calculated in mL/minute:

- e.g. A dog needs 116mL/hour
- 116mL/hour/60 = 1.93mL/minute

The amount needed per minute then has to be multiplied by the drops/mL that the giving set delivers. This can be found on the giving set. Use this to convert the amount needed in mL per minute to the number of drops per minute.

- e.g. A 20drops/mL giving set
- 93mL/min x 20 = 38 drops per minute

Set up the giving set to deliver 38 drops per minute

To check, the drip rate can be measured over a shorter period of time

- e.g. 19 drops over 30 seconds, ~10 drops over 15 seconds

Note: Fluid administration rates can be controlled more accurately using an infusion pump.

- Current practice for fluid administration during anaesthesia:
- 2 4mL/kg/hr (healthy animal, minimal fluid losses e.g. blood loss or evaporation) Faster rates may be required for individual animals i.e. for different cases and situations

Important metabolic diseases

1. Ketosis

Definition: it is a disease of lactating cows characterized

-Clinically by loss of body weight, reduced milk yield, nervous signs (e.g. walking in circles, straddling or crossing of the legs, head-pushing, apparent blindness, aimless movements and wandering, vigorous licking of the skin and inanimate objects, depraved appetite and chewing movements with salivation), Laboratoricaly by ketonemia, ketonuria, hypoglycaemia, & ketone bodies in milk.

Ketosis is basically the result of a negative energy balance early in lactation. High milk production causes energy (glucose) drain and the need for energy exceeds the capacity. A defecit in digestion or metabolism may result in inadequate amounts of glucose (hypoglycemia) available at the cellular level. In an effort to correct this condition, body fat and limited protein stores are mobilized for gluconeogenesis in the liver with a parallel rise in ketone body formation. These ketone bodies have a toxic effect to the CNS if the level rises beyond the physiological limit. It occurs most commonly during the first month of lactation, less commonly in the second month, and only occasionally in late pregnancy. The highest frequency is between 20-30 days after calving. It can occur in cows of any age, rarely at first lactation, reach its peak at fourth**.**

Hypophosphatemia- Chronic P Deficiency Syndrome

- When soil is deficient the P content fodder is low- High nitrogen fertilizers
- Feed deficient in grains- high alfalfa- feeding - P deficiency

- Osteoporosis - rickets - bone density
- Pica
- Sub-fertility- delayed maturity, anoestrus, abnormal calving, abortions
- Phosphorus is essential for metabolism- ATP-hence part of energy metabolism
- Haemolytic syndrome
- Daily requirement of P is around 15-16 g for maintenance and 1.25 g per kg milk but bioavailability is 45-50% hence around 40 g P supplementation is necessary
- Dry matter intake dependent-before and after calving Dry matter intake is reduced

Milk fever

Definition: it is a metabolic disease occurring most commonly about the time of parturition in adult females and is characterized by hypocalcaemia, general muscular weakness, circulatory collapse and depression of consciousness. **Etiology:** sudden loss of calcium through milk at or near the time of parturition. Serum phosphorus is decreased but Serum magnesium is increased. Hypocalcaemia causes general muscle weakness, circulatory collapse, depression and unconsciousness. **Clinical findings:** there are three different stages of milk fever:

Stage1 is a brief excitement and tetany with hypersensitiveness and muscle tremor of the head, flank and limbs. Animal is able to stand but restlessness, shuffling feet, bellowing, and open-mouth breathing with tongue extension. **Stage2 is sternal recumbency.** In this case the patient is unable to stand, depression, anorexia, subnormal temperature, loss of defecation and urination, GIT atony (i.e. mild bloat, constipation), decreased heart sound, retained fetal membrane, lies on her brisket with the head characteristically turned into the flank over one shoulder or rested on the ground &eye blinking. **Stage3, lateral recumbency.** Lose consciousness progressively to the point of coma, unresponsive to stimuli, severe bloat because of lateral recumbency and GIT atony, heart sound becomes inaudible and pulse may be undetectable.

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. The healthy body contains between 60% and 70% water, which is found inside and surrounding all the cells.
2. Fluid and electrolyte replacement therapy in livestock is needful during negative fluid balance that is when fluid intake is less than the fluid loss from the body.
3. Oral rehydration therapy can be used to correct severe dehydration.

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

1. Fluid rates must be adjusted according to:
   A. On going losses
   B. Maintenance fluid
   C. Fluid deficit
   D. All of the above

Test III. Short Answer Questions (10 each point)

1. A 15 week old, 6.8kg puppy has been admitted with vomiting and diarrhoea that have been present for 2 days. The puppy is 6% dehydrated which needs to be corrected over 24 hours. What fluids will be used initially for the puppy and what drip rate would be used? The giving set delivers 20 drops/ml.
2. A dog is admitted following a road traffic accident (RTA) and is in hypovolaemic shock. The dog weighs 35kg and you decide that it needs a bolus of fluids. You decide to give it a 30mL/kg bolus over 20 minutes. The giving set delivers 20 drops/ml. What would the drip rate be? What could be done to try to ensure the animal received this volume in the time required?

Note: Satisfactory rating 20 points Unsatisfactory - below 20 points

You can ask your teacher for the copy of correct answers

Information Sheet 6- Disposing waste

6.1 Introduction

Storage facility grounds, including the area around health centers, must remain free of health care waste and other garbage. Maintaining a clean environment where pharmaceuticals and other animal health supplies are stored will reduce the number of pest insects and rodents and reduce the number of animals, people, including children, who may be injured by used medical equipment or discarded medicines. Check with local officials about laws that pertain to animal health care waste management and environmental protection before instituting a disposal technique. Plan storage, transportation, and disposal techniques that are practical and simple. Monitor disposal practices on a regular, frequent basis.

4.5 Waste disposal methods

Waste management options are listed in order of desirability from most desirable at the top to least desirable at the bottom.

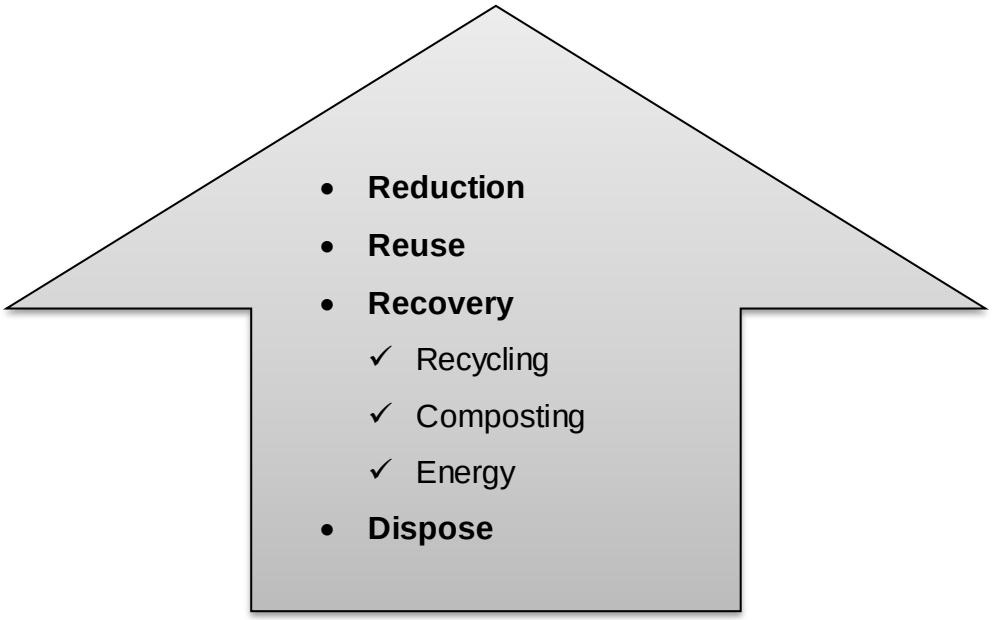

Figure 18. The waste hierarchy.

6.3 Type of Wastes

Different types of waste that must be destroyed safely and effectively and their methods of disposal include:

1. Non-medical waste (General Wastes)

a) **Garden rubbish:** Compost leaves, sticks, weeds, and trimmings from shrubs and trees, if feasible. Designate a separate area for composting.

b) **Cardboard cartons:** If possible, recycle cardboard; otherwise, treat like ordinary rubbish.

c) **Ordinary rubbish:** Where municipal solid waste facilities exist, dispose of ordinary rubbish in the municipal dump. Otherwise, burn or bury it.

d) **Human waste:** Use pit latrines or other toileting facilities to dispose of all human waste.

e) Animal wastes (from animals, tissue or bedding)

1. Health care waste

a) **Sharps waste:** Single-use disposable needles, needles from auto-disable syringes, scalpel blades, disposable trocars, sharp instruments requiring disposal, and sharps waste from laboratory procedures.

b) **Hazardous medical waste:**

Waste contaminated with blood, body fluids, animal tissue; compounds such as mercury; pressurized containers; and wastes with high heavy metal content.

c) Pharmaceuticals:

Expired, damaged, or otherwise unusable medicines and items contaminated by or containing medicinal substances.

Figure 19. Expired medical wastes

6.3 Waste disposal methods

Burial pits and encapsulation are suitable in locations without shallow groundwater and for small volumes of waste.

a) **Burial pits:** The bottom of the pit should be 1.5 m above the groundwater level, 3–5 m deep, and lined with a substance of low permeability, such as clay. Surround the opening with a mound to keep run-off water from entering the hole, and build a fence around the area. Periodically, cover waste layers with 10–15 cm of soil.

b) **Encapsulation:** Cement-lined pits or high-density plastic containers or drums are filled to 75% capacity with animal health care waste. The container is then filled with plastic foam, sand, cement, or clay to immobilize the waste. The encapsulated waste is then disposed of in a landfill or left in place if the container is constructed in the ground.

c) **Incineration:** Medium- and high-temperature incineration devices require a capital investment and an operations and maintenance budget. They operate on fuel, wood, or other combustible material and produce solid ashes and gases. Pollutants are emitted to varying degrees. The ash is toxic and must be buried in a protected pit. Combustible waste is reduced to incombustible waste with a decreased volume. The high temperatures kill microorganisms.

- **Medium-temperature incinerators,** commonly a double-chamber design or pyrolytic incinerator, operate at a medium-temperature combustion process (800°–1,000°C).
- **High-temperature incinerators,** recommended by WHO, treat health care waste at a temperature >1,000°C. When operated by staff trained in correct use and maintenance, incineration in a device like this one
    - ✓ Completely destroys needles and syringes
    - ✓ Kills microorganisms
    - ✓ Reduces the volume of waste
    - ✓ Generates less air pollution than low-temperature burning.

Note: Incinerate pharmaceuticals only if absolutely necessary.

- **Low-temperature burning:** Burning devices not exceeding 400°C include single-chamber brick hearths, drum burners, and burning pits. They burn incompletely and do not fully destroy waste. They may not kill microorganisms. Given these shortcomings, low-temperature burning should be used only as a short-term solution.

d) Burn and bury: Pit burning is a low-cost but relatively ineffective means of waste disposal. A fence should surround the pit to prevent children, animals, and others from coming into contact with the waste. The pit location should avoid walking paths (high-traffic areas). The fire, usually started with a petroleum-based fuel and allowed to burn, should be supervised by designated staff and located down-wind of the facility and residential areas. The low-temperature fire emits pollutants, and the ash and remaining material should be covered with 10–15 cm of dirt.

Waste types not to be incinerated

- Pressurized gas containers.
- Large amounts of reactive chemical waste.
- Silver salts and photographic or radiographic wastes.
- Halogenated plastics such as polyvinyl chloride (PVC).
- Waste with high mercury or cadmium content, such as broken thermometers, used batteries, and lead-lined wooden panels.
- Sealed ampoules or ampoules containing heavy metals.

Pharmaceutical disposal

It is very important to dispose of pharmaceuticals properly because there can be very negative consequences to improper disposal. Improper disposal can result in

- Contaminated water supplies
- The diversion and resale of expired or inactive medicines
- Improperly incinerated products, which can release toxic pollutants into the air.

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).

1. Maintaining a clean environment where pharmaceuticals and other animal health supplies are stored will reduce the number of pest insects and rodents.

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

1. Which one of the following is non medical wastes?
   A. Ordinary rubbish
   B. Pharmaceuticals
   C. Biological waste (expired vaccine)
   D. Epired disposable needle
2. Which arrangements of waste management options are listed in the order of desirability from most desirable to least desirable?
   A. Reduction –Reuse – Recovery – Dispose
   B. Dispose – Reused – Recovery – Reduction
   C. Dispose – Recovery – Reuse – Reduction
   D. Recovery – Reuse – Reduction Dispose

Test III. Short Answer Questions (5 point)

1. Describe and discuss briefly the ways of waste disposal?

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

You can ask your teacher for the copy of correct answers

Information Sheet 7- Keeping and reporting record

7.1 Introduction

Adequate written treatment records must be maintained by the veterinarian for at least two years (or as otherwise mandated by law), for all animals treated, to document that the drugs were supplied to clients in line with federal and state rules and policies and Principles of Veterinary Medical Ethics. Such records must include the information set forth under basic Information for records, prescriptions, and Labels. Food animal owners should have a written treatment records system in place to decrease the risk of violate residues in meat, milk or eggs. All patient treatments should be recorded. Food animal owners must keep records when engaging in when milk and or meat withdrawal of a certain drug may differ from its label. Owner treatment records have been developed by several producer organizations and are available in conjunction with quality assurance programs.

All veterinary prescription drugs must be properly labeled when dispensed. A complete label should include all the information set forth under the section on Basic Information for Records, Prescriptions, and Labels.

7.2 Basic information for records

- Prescriptions
- Labels
- Name, address, and telephone number of veterinarians
- Name, address, and telephone number of clients
- Identification of animal treated, species and numbers of animals treated, when possible
- Date of treatment, prescribing, or dispensing of drug
- Name, active ingredient, and quantity of the drug (or drug preparation) to be prescribed or dispensed
- Drug strength (if more than one strength available)

- Dosage and duration
- Route of administration
- Number of refills
- Cautionary statements, as needed
- Expiration date if applicable
- Slaughter withdrawal and/or milk withholding times, if applicable
- Signature or equivalent

Different types of record in veterinary clinic/pharmacy

- Record to be kept by a veterinary of surgeon
- Patient record (History and patient identification)
- Medical product record (drug, chemicals and vaccine)
- Sales record
- Waste management record
- Treatment and vaccination record

7.2 Record reporting

Reporting is providing information about what the reporter have become aware of at workplace/ place of study. Reporting is about notifying concerning what you believe to be the discovery of breaches of laws and regulations, breaches of ethical norms or serious conditions which might harm individuals, the university, cooperative partners, or society as a whole. A report is a document that presents information in an organized format for a specific audience and purpose. Although summaries of reports may be delivered orally, complete reports are almost always in the form of written documents.

Importance of reporting

- Reduce the potential for a recurrence
- Minimize losses to both the workforce and production
- Reduce the effect of any future incident
- To inform the ongoing progress

Table 6. Record format for chemical/drug use

Date of treatment	Product trade name	Species	Location of animal	Animal identification number, name or description	Quantity of product used (dose) per animal	No. of animals treated	Approx. live weight	Batch No.	Expiry date	WHP/ESI (days)	Date safe for slaughter*	Name of applicator (person)

WHP - Withholding period
ESI - Export slaughter interval

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

1. Adequate written treatment records must be maintained by the veterinarian for at least two years.
2. Food animal owners should have a written treatment records system in place to decrease the risk of violate residues in meat, milk or eggs.

Test II. Short Answer Questions (10 point)

1. Describe the basic informatio tha are included while record keeping.

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

You can ask your teacher for the copy of correct answers

Operation Sheet: Procedure to load a syringe during taking drug

Procedure: Loading a syringe with drug

Objective: Loading a to the syringe

Materials: (Syringe, glove, gown, drug)

Procedure:

Step 1: Be sure the needle is fi rmly attached.

Step 2: Draw some air into the syringe by pulling back the plunger.

Step 3: Turn the bottle of medicine upside-down, insert the needle through the centre of the rubber stopper and slowly inject air into the bottle.

Step 4: Now draw the medicine into the syringe.

Step 5: Keep the bottle above the syringe so any air bubbles in the syringe go to the top.

Step 6: Push the plunger carefully so the air comes out.

Step 7: Now see if the right amount is in the syringe (the top of the plunger should be on the line for the proper dose).

Step 8: Withdraw more medicine or squirt some back into the bottle until the right amount is in the syringe.

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 15 min. 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 to load a syringe during taking drug

Task: Perform loading of a syringe with drug/medicine.

LG 59	LO 3. Assist in Stock Control and Clinic Security

Instruction sheet

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

- Taking inventory of veterinary supplies and medicines
- Ordering medicines and supplies
- Checking clinic stocks
- Handling and storing drugs
- Using clinic security measures

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:

- Take inventory of veterinary supplies and medicines
- Order medicines and supplies
- Check clinic stocks
- Handle and store drugs
- Using clinic security measures

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- Taking inventory of veterinary supplies and medicines

1.1 Introduction

Every veterinary practice needs someone to take responsibility for managing the practice's inventory. This person might be the Practice Owner, the Practice Manager, an associate veterinarian, or an experienced technician or assistant. In any case, the hospital's inventory manager must be: highly organized, familiar with veterinary drugs and products, and fiscally responsible. Inventory includes:

- Drugs/medicines
- Ointments
- Clinic consumable supplies
- Pet food and other over the counter products.
- Biological agents

It does not however, include outside diagnostic fees, cremation expenses, temporary locum services or referral services, which can be reported as one total expense on financial statements under the general caption.

Inventory is the amount of pharmaceuticals, medical supplies, food, and retail items a business keeps on hand to meet the demands of customers and patients. Depending on the nature or type of practice, the efficiency of your inventory management plan may have a significant impact on your cash flow and, ultimately, your business success or failure. Inventory remains one of the leading expenses that veterinarians face, and continues to be an area of very low management. Inventory impacts the practice; financial, operational, and managerial.

Inventory travels through the hospital and passes through the hands of many staff members, a job description can serve as a proactive approach to protecting your investment and the patient. Below is a list of veterinary positions and inventory duties that may relate to that position:

- **Customer service representative**: Field phone calls related to prescription refills, check in medications for boarding animals, check out customers with prescriptions, and invoice inventory.
- **Technician assistant staff:** Check in medication for boarding animals, assist in medication administration, unpack vendor shipments, and invoice inventory.
- **Accredited technician/senior technician**: Check in medication for boarding animals, administer medications in house, fill prescriptions, order/receive inventory, and invoice inventory.
- **Practice manager/office manager:** Create inventory budget, order/ receive inventory, matching invoice/statements, bookkeeping duties, and invoice inventory.
- **Associate veterinarian**: Prescribe medication, administer medication, assist in pricing strategy, order/request inventory, and invoice inventory.
- **Veterinarian/owner:** Create budget, create profit strategy, prescribe medication, administer medication, order inventory, invoice inventory, and pay vendor.

Create a list of inventory duties to be done daily, weekly, monthly, quarterly, semi-annually, and yearly. Then document a sequence of steps to accomplish each duty. Among these lists and steps, be sure to include:

3. Review reorder reports and want list.
4. Calculate budget for ordering.
5. Ordering, receiving, and stocking.
6. Monitor and adjust internally used items.
7. Cycle count inventory and record variances.
8. Review re-order points.
9. Complete analysis on yearly sales and purchases.
10. Annual review of inventory operating procedures.

1.2 Inventory management

The on-farm/clinic veterinary medicine inventory should be managed according to the following procedures:

- Purchase drugs in quantities which will be used in a reasonable amount of time.
- Check product expiry dates before purchase.
- Clean and reorganize the drug cabinet on a regular schedule.
- Use products with older expiry dates first.
- Discard all expired products.

Physical inventory count sheet

Table 7 Physical inventory format for different veterinary supplies

Sheet----------			Date----------		
Counted by----------			Signature----------		
Item number	**Description**	**Location**	**Purchase price**	**Quantity**	**Remark**

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).

1. Inventory is the amount of pharmaceuticals, medical supplies, food, and retail items a business keeps on hand to meet the demands of customers and patients.

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

1. What are the veterinary inventory management includes?
   B. Drugs/medicines
   C. Clinic consumable supplies
   D. Pet food and other over the counter products.
   E. Biological agents
   F. All of the above

Test III. Short Answer Questions (10 point)

1. Describe a list of inventory duties to be done daily, weekly, monthly, quarterly, semi-annually, and yearly.

Note: Satisfactory rating 9.5 points **Unsatisfactory - below 9.5 points**

You can ask your teacher for the copy of correct answers

Information Sheet 2- Ordering medicines and supplies

2.1 Introduction

Veterinarians and nurses are both medical professionals but veterinarians are required to have more extensive training. Veterinarians treat animals while nurses focus on providing medical care to animals. The responsible use of veterinary medicines for therapeutic and prophylactic purposes is one of the major skills of a veterinary surgeon and crucial to animal welfare and the maintenance of animal health Veterinary prescription drugs are labeled for use only by or on the order of a licensed veterinarian. Incidents involving the sale and use of prescription drugs without a prescription should be reported to the proper state authority.

Veterinary prescription drugs are to be used or prescribed only within the context of a veterinarian-client-patient relationship (VCPR). Veterinary prescription drugs must be properly labeled before being dispensed. Appropriate dispensing and treatment records must be maintained. Veterinary prescription drugs should be dispensed only in quantities required for the treatment of the animal(s) for which the drugs are dispensed. Avoid unlimited refills of prescriptions or any other activity that might result in misuse of drugs. Any drug used in a manner not in accordance with its labeling should be subjected to the same supervisory precautions that apply to veterinary prescription drugs.

2.2 Prescribing and Dispensing

A veterinary prescription shall include all of the following:

- The name and address of the veterinarian and, if the prescription is a written order, the signature of the veterinarian;
- The name and address of the client;
- The species and identity of the patient for which the prescription is issued;
- The name, strength, and quantity of the drug prescribed;

- The date on which the prescription is issued;
- The directions for administering the drug;
- If the patient is a food producing animal, the withdrawal time for the veterinary drug;
- If the prescription authorizes extra-label use, the manner in which the client may use the drug;

Dispensing: is the interpretation, evaluation, supply and implementation of a prescription, drug order, including the preparation and delivery of a drug or device to a patient or patient's agent in a suitable container appropriately labeled for subsequent administration to, or use by, a patient.

Veterinarian/client/patient relationship

A VCPR exists when all of the following conditions have been met:

- The veterinarian has assumed the responsibility for making clinical judgments regarding the health of the animal(s) and the need for medical treatment, and the client has agreed to follow the veterinarian's instructions.
- The veterinarian has sufficient knowledge of the animal(s) to initiate at least a general or preliminary diagnosis of the medical condition of the animal(s). This means that the veterinarian has recently seen and is personally acquainted with the keeping and care of the animal(s) by virtue of an examination of the animal(s) or by medically appropriate and timely visits to the premises where the animal(s) are kept.
- The veterinarian is readily available for follow-up evaluation, or has arranged for emergency coverage, in the event of adverse reactions or failure of the treatment regimen.

Prior to prescribing or dispensing a food-animal drug for extra label use the veterinarian must:

- Make a careful diagnosis and evaluation of the conditions for which the drug is to be used.
- Assure that the identity of the treated animal(s) is carefully maintained.

- Use appropriate scientific information to establish a substantially extended withdrawal period prior to marketing milk, meat, eggs or other edible products from the treated animals.
- Take appropriate measures to ensure that the recommended withdrawal times are met and no illegal drug residues occur.
- If there is insufficient scientific information available to determine a withdrawal interval, the veterinarian must not use the drug or the treated animal must not enter the food supply.
- Use of a human drug, or an animal drug that is only approved for use in nonfood-producing animals, has further restrictions. These drugs are not permitted if a drug that is labeled for use in a food-producing animal can be used in a labeled or extralabel manner.
- The extralabel use of certain drugs is prohibited in food animals. This list may be amended by the Food and Drug Administration. Thus, the following list is accurate as of the publication date of this document.

2.3 Veterinary prescription orders

Orders issued by licensed veterinarians authorize drug distributors to deliver veterinary prescription drugs to a specific client, or authorize pharmacists to dispense such drugs to a specific client. Veterinarians should assure compliance with relevant regulations (e.g. VCPR) of their State Board of Pharmacy and State Board of Veterinary Medicine, and applicable federal regulations.

The following is a standard form of prescription used:

Table 8. Standard drug prescription format and its contents

From: Address of practice----------Date----------
Telephone No----------
Animal's name and identification----------Owners name----------
Species----------Owners address----------
Breed----------
Sex----------
• Treatment (RX)
• Print name, Strength, and formulation of drug
• Total quantity to be supplied
• Amount to be administered
• Duration of treatment
• Any warnings
• For animal treatment only
• For an animal under my care
No repeat/repeat 1, 2, 3
Name, qualifications and signature of veterinarians

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. Veterinary prescription drugs are to be used or prescribed only within the context of a veterinarian-client-patient relationship.
2. Veterinary prescription drugs should be dispensed only in quantities required for the treatment of the animal(s) for which the drugs are dispensed.

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

1. Prior to prescribing or dispensing a food-animal drug for extra label use the veterinarian must:

A. Make a careful diagnosis and evaluation of the conditions
B. Take measures to ensure that the recommended withdrawal times are met
C. Assure that the identity of the treated animal
D. All of the above

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- Checking clinic stocks

3.1 Introduction

A stock check of all drugs of need must be completed by a veterinarian at least twice a year. Immediately under the last entry for each drug they should write the date on which the check was made, the words "Balance on hand," the quantity held, and should sign the entry. Drugs must be kept in a safe attached to the premises. Keys to the safe containing drugs should not be left on the premises unless they can be locked in another safe and only a vet can have ultimate access to the drugs or the keys to the safe containing S8 drugs.

Drug register must be kept with the following details:

- The date of the entry
- The name and address of the supplier (in the case of receipt) or the name and address of the animal's
- Owner and the species of animal (in the case of administration or supply)
- The quantity received, supplied or used and the balance held after the transaction
- The name of the veterinary practitioner authorizing the supply or use
- The signature of the veterinary practitioner actually supplying, using or administering the drug.

If a drug of addiction becomes unwanted or is out of date, it may be destroyed under the supervision of a police officer, by an authorized officer of the Ministry of Health or by a retail pharmacist in the presence of the veterinarian either at the latter's premises or at the pharmacy. In all cases the destruction must be recorded in the veterinarian's drug register, signed and dated by the person carrying out the destruction and co-signed by the practitioner. A pharmacist must also include their name and professional registration number in the entry.

3.2 Veterinary inventory management activities

Having understood the importance, it is also important to know the activities that a practice or veterinary hospital needs to do to manage their inventory. This gives clinic owners clarity so that a focused effort can be made in this area:

- Managing optimum stock levels of inventory items.
- Priority ordering based on the different parameters like the turnover rate of items, the dollar value of the item etc.
- Defining and fine-tuning the re-order quantity based on forecasted demand and historic usage.
- Handling of the expired items on time to avoid expiry related costs.

Attainment better at Inventory management for veterinary clinics

Have good inventory management board

Depending on the practice size, it is imperative to have a good inventory manager. Considering the financial implications of inventory management, it is worth investing on a dedicated inventory manager who (or his/her team) will take care of all strategies and execution of inventory management. It is to be understood that the inventory manager will work in close conjunction with the practice manager.

Monitor the inventory prices to ensure right markup

With prices being dependent on several factors, which might change, daily, it is important to keep a track of inventory prices while ordering. This would help practices to keep the markup at the right value to ensure that the eventual business does not result in a loss.

Regularly check the records of the inventory system

Checking the inventory manually at the end of fiscal year

It is recommended that clinics and hospitals do a manual check of the inventory at the end of fiscal year. It serves multiple purposes like

- It helps them to put a more accurate value of the inventory on books
- It helps the practice to know the pilferage, expiry or other operational impacts on inventory
- It helps the inventory manager to know the minimum and maximum value over a long horizon, which can help them to do a better long term plan.

Getting the right re-order

Inventory replenishment is a challenging task for a practice since either the re-order quantity goes haywire or the order gets delayed. It is important for inventory and practice managers to analyze the historical data well and forecast the demand accurately to ensure right re-order quantity and also consider the lead time for the order to fulfill. Else, even though the quantity is right, it might get filled up late and have adverse impacts.

Have technology in place

Having barcode scanners, inventory management systems etc. can prove to be lifesaver in this tight situation. Research says that it remains one of the most un-utilized modules in the veterinary computer programs even though the benefits are immense. It helps one to have a constant control over inventory, generate order (and re- order) lists, reduces in-accuracies to name a few benefits.

Develop standard operating procedures

Inventory will have constant interaction with the veterinarians and the staff. In the absence of standard operating procedures, managing inventory will become a nightmare. It is advised that the inventory manager created standard operating procedures to handle the inventory, which is followed by the whole practice. In conclusion, the importance of Inventory management is well understood, still inventory management is one of the most under practiced task in a clinic. If a Veterinarian cannot engage in all the above-mentioned points, it is suggested to start with some of the basic points and move on gradually. With Inventory management having such high impact on the financials, not managing it will have a huge dent on the books.

Stock medication guidelines

Objective: To provide uniform guidelines for ordering and maintaining stock medications in clinical areas

- Stock Medications should always be locked in a designated area
- Nursing staff should verify/check all medication expiration dates by the third week of each month.
- Any medications discarded should be noted in the comment section of the monitoring log.
- Nursing staff should return expired medications to the pharmacy and order replacement medications from the pharmacy.
- All oral tablets should be in unit dose unless it is not commercially available
- Once a bottle or vial of stock medication is opened for use, the date, time, and nursing staff's initials must be placed on the bottle.
- Once a bottle or vial of stock medication is opened, it must be discarded after the opening has exceeded 28 days (4 weeks) from the date it is opened.
- All injectable reconstituted stock medications must be discarded if the entire dose is not given to the patient.
- It is prohibited to use leftover stock medication intended for 'single use' on another patient or put in refrigerator for later use.
- Maintain a monthly log (attached) regarding monthly audit of stock medication as a means of ensuring that expired medications are discarded and replaced.

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. A stock check of all drugs of need must be completed by a veterinarian at least twice a year.
2. Regularly checking of records of the inventory system is not mandatory.
3. Checking the inventory manually at the end of fiscal year helps the inventory manager to know the minimum and maximum value over a long horizon.

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

1. Drug register must be kept with the following details except:
   A. The date of the entry of drug
   B. The name and address of the supplier
   C. The quantity of drug received
   D. Expiry date of drug/shelf life of the drug
   E. None of the above

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

You can ask your teacher for the copy of correct answers

Information Sheet 4- Handling and storing drugs

4.1 Introduction

Drug storage is among the pharmacist's most important responsibilities. Therefore, adequate methods to assure that these responsibilities are met must be developed and implemented. The pharmaceutical are to be stored under conditions that prevent contamination and, as far as possible, deterioration. The stability of product retain within the specified limit, throughout it period of storage and use. Precautions that should be taken in relation to the effects of the atmosphere, moisture, heat and light are indicated. During storage of the pharmaceutical products is one of the fundamental concerns in patient care. The loss of potency during storage may influence the efficacy and safety of pharmaceuticals. Pharmaceutical products require controlled storage and transit conditions in order to ensure that their quality is not compromised. Storage is an important aspect of the total drug control system. Proper environmental control (i.e., proper temperature, light, and humidity, conditions of sanitation, ventilation, and segregation) must be maintained wherever drugs and supplies are stored in the premises.

4.2. Storing medicines

Different pharmaceutical product storage temperature on the basis of stability studies as given below:

Freezer: A place in which the temperature is maintained thermostatically between -25ºC and – 10ºC (-13 ºF and -14 ºF).

Cold: Any temperature not exceeding 8ºC (46 ºF). A refrigerator is a cold place in which the temperature is maintained thermostatically between 2ºC and 8ºC.

Cool: Any temperature between 8 ºC and 15 ºC. Any pharmaceutical products for which storage in a cool place directed may, alternatively, be stored in a refrigerator, unless otherwise specified in the individual monograph.

Good storage practice (GSP) is applicable in all circumstances where pharmaceutical

products are stored through the distribution processes.

Storage condition on label

Storage conditions for pharmaceutical products and materials should be in compliance with the labelling, which is based on the results of stability testing Storage conditions should be defined and described on the label of the product. All drugs should be stored according to the conditions described on the label. When specified on the label, controls for humidity, light, etc., should be in place. Storage areas should be designed or adapted to ensure good storage conditions. The label should specify any special storage conditions required for the product. Written procedures should be available describing the actions to be taken in the event of temperature excursions outside the labeled storage conditions. All excursions outside the labeled storage conditions must be appropriately investigated and the disposition of the stock in question must be evidence-based (for example, stability data and technical justification). Stability testing thus evaluates the effect of environmental factors on the quality of the a drug substance or a formulated product which is utilized for prediction of its shelf life, determine proper storage conditions and suggest labeling instructions.

Storage of Tablet

Storage on label:

- Store in a cool, protected from light and moisture.
- Store in a cool and dark place, protected from light and moisture.
- Keep in a dry dark place, Store in cool dry and dark place.

Storage of Capsule

Storage on label: Store in a cool and dry place, protected from light.

Storage of Emulsion

An emulsion should be stored in air tight container, protected from light, high temperature or freezing. The emulsions are required to be in cool place

Storage of Suspension

Suspension should be stored in a cool place but not be kept in a refrigerator. Freezing at a very low temperature should be avoided which may lead to aggregation of the suspended particles.

Storage on label:

- Store in cool and dry place, protect from heat and light.
- Store in a cool and dark place, protect from direct sun light.
- Keep in dry place at a temperature not exceeding 30 ºC. keep the bottle tightly closed.
- Store below 25 ºC, protected from moisture.
- Store at temperature not exceeding 30 ºC, protect from light.

Storage of ointment

Ointment should be stored in well closed container so as to prevent the loss of volatile constituents. The ointment should be protected from high temperature or direct sunlight.

Storage on label:

- Keep in a cool place.

Storage of Paste

The paste should be stored in well closed container and in a cool place so as to prevent evaporation of moisture present.

Storage of syrup

The syrup should be stored in well closed and stopper bottle in a cool dark place. The syrup should be stored at a temperature not exceeding 25 ºC.

Storage on label:

- Store in cool, dry and dark place.
- Store in a cool and dry place, protected from light.
- Store in a cool place, protected from direct sunlight.

Storage of oral drop

Storage on label:

- Store at temperature not exceeding 30 ºC.
- Store in cool, dry place and protected from light.
- Store at temperature not exceeding 30 ºC, protect from direct sunlight.
- Keep in a dry place, dark place.
- Store in a dry place, away from light.

Storage of injection

Storage on label:

- Store below 30 ºC, protected from light.
- Store below 25 ºC, protected from light.

Vaccine storage

Vaccines are expensive and fragile, and storing them at the proper temperature is essential to providing effective immunizations. The vaccines should always be stored in their original packaging until point of use to protect them from light. The vaccine temperature must be maintained in an insulated container between +2ºC to +8ºC at all times. Vaccine storage and handling are key components in maintaining the efficacy of immunization programs. Cold chain refers to the process used to maintain optimal conditions during the transport, storage, and handling of vaccines, starting at the manufacturer and with administration of the vaccine. The optimum temperature for refrigerated vaccines is between 2°C and 8°C. For frozen vaccines the optimum temperature is –15°C or In addition, protection from light is a necessary condition for some vaccines.

Cold chain equipment

All cold chain equipment has to comply with a set of performance standards defined by the WHO or national policy. Only proven methods should be used to transport or store vaccines: for example, insulated containers proven through electronic temperature logging as reliable in maintaining the recommended temperature (solid wall transport containers, double walled transport containers and polystyrene containers).

The recommended equipment typically used for vaccine storage are :

- Cold rooms,
- Refrigerators
- Freezers.

For transporting vaccines equipment such as are commonly used.

- Cold boxes,
- Vaccine carriers and
- International containers

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. The pharmaceutical are to be stored under conditions that prevent contamination and, as far as possible, deterioration.
2. Good storage practice is applicable in all circumstances where pharmaceutical products are stored through the distribution processes.
3. Only few drugs should be stored according to the conditions described on the label.
4. All cold chain equipment has to comply with a set of performance standards defined by the WHO or national policy.

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

1. Which one of the following is not the recommended equipment/storage room typically used for vaccine storage?
   A. Cold rooms
   B. Refrigerators
   C. Freezers
   D. Cold boxes

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

You can ask your teacher for the copy of correct answers

Information Sheet 5- Using clinic security measures

5.1 Introduction

Biosecurity is a set of preventive measures designed to reduce the risk of transmission of infectious diseases. To better understand how these practices can be best implemented, it is important to know how infections begin and are transmitted and what measures can be taken to prevent them.

5.2 Clinic security measures and infection control principles

The following principles have guided the development of all infection control policies. These precautions help prevent disease transmission from staff to patient, patient to patient and patient to staff.

- **Optimize hygiene:** through the use of standard precautions including hand washing, proper attire and barrier protection, minimizing unnecessary contact with patients, appropriate disposal of infectious materials and proper cleaning and disinfection.
- **Break transmission:** cycles by understanding routes of disease transmission, creating barriers to direct and indirect transmission of infectious agents for patients with differing risks for contagious disease transmission, and effective use of hygiene protocols. This includes consideration of traffic patterns and kenneling of patients, as well as traffic patterns of staff and visitors.
- **Target and refine infection control procedures:** through surveillance and other investigative procedures.
- **Enhance education and awareness:** regarding nosocomial and zoonotic disease risks through optimizing communication about the purpose for these guidelines and procedures.

Optimizing hygiene: Hand hygiene is the single most important factor affecting the risks of transmitting contagious organisms. Effective hand hygiene kills or removes microorganisms on the skin while maintaining hand health and skin integrity (i.e. prevents chapping and cracking of skin). Sterilization of the hands is not the goal of routine hand hygiene - the objective is to reduce the number of microorganisms on the hands, particularly the number of microorganisms that are part of the transient microflora of the skin, as these include the majority of opportunistic pathogens on the hands. These transient microbes may be picked up by contact with a patient, another person, contaminated equipment, or the environment.

Washing with soap and running water or using an alcohol-based hand sanitizer. Alcohol-based hand sanitizers are not effective against certain pathogens, including bacterial spores (e.g. clostridial spores) and Cryptosporidium spp. Alcohol is also not as effective against non-enveloped viruses (e.g. canine parvovirus, feline pan leukopenia virus) as it is against most other microbes.

Breaking transmission cycle: Routes of disease transmission of many disease agents can survive for extended periods of time in the air, on surfaces and in organic material. Pathogenic disease agents can be spread from animal-to-animal, animal-to-human or even human-to-animal, through inhalation, oral consumption, direct contact with nasal or ocular mucosal surfaces, and indirect contact. Transmission can also be via fomites or vectors. Awareness of these routes of disease transmission can help prevent transmission and therefore mitigate any potential effects. Cleaning and disinfection of premises, equipment, and vehicles will play a vital part in the control of disease transmission, along with personal hygiene

Aerosol transmission: occurs when infectious agents contained in aerosol droplets are passed between susceptible species. Most pathogenic agents do not survive for extended periods of time within the aerosol droplets and as a result, close proximity of infected and susceptible animals is required for disease transmission. The greater the distance between animals, the less likely transmission will occur. Aerosol transmission may occur through close contact of animals and/or humans. Infectious agents may be

freshly aerosolized (as in a sneezing cat with feline respiratory virus), may be re-aerosolized by high-pressure washing or on dust particles by air currents. Temperature, relative humidity and ventilation play important roles in aerosol transmission of pathogens.

Oral transmission: involves exposure to infectious agents by the gastrointestinal route. This also can occur inadvertently through inhalation of aerosolized material and subsequent swallowing of materials through the nasopharynx. Contaminated environmental objects include equipment such as food and water dishes, and any other items an animal could lick or chew. Feed and water contaminated with faeces or urine are frequently the cause of oral transmission of disease agents. In people, oral contact with contaminated hands is commonly part of the transmission cycle for oral-faecal agents, which exemplifies the need for excellent hand hygiene among personnel working around animals. Appropriate handling and segregation of patients with diarrhoea will help control the spread of potentially infective organisms in faeces as will proper cleaning and disinfecting of food and water dishes.

Direct contact transmission: requires an animal or person to directly contact another infected animal or person. Indirect contact transmission occurs through contact with surfaces or materials that have been contaminated with a variety of substances (e.g., blood, discharge from wounds, saliva, nasal secretions or aerosolized respiratory droplets, genitourinary secretions, faecal material, etc). It is important to remember that patients in the hospital have a highly likelihood of being infected with contagious pathogens, and therefore surfaces throughout the facility have a high likelihood of being contaminated with infectious agents. As such, the most important method of reducing the potential for direct and indirect contact transmission is the segregation of infected animals and minimizing contact with them. Since not all infected animals show signs of illness, generalized efforts to decrease the likelihood of animals coming into direct contact and segregating patients in different populations eg. Hospitalized patients and staff pets.

Fomite transmission: Fomites are objects that serve as intermediates in contact transmission cycles. Virtually any object can serve as a fomite, even a person acting as a caregiver. For example: a door knob, keyboard, telephone, clothing, thermometer, stethoscope, lead, brush, etc., are all items that can be contaminated with infectious agents and serve as an exposure source involved in contagious disease transmission. An important aspect of fomite transmission is that portable items can be contaminated near one patient and then be a source of transmission for patients or staff in other areas of the hospital. The most important means of controlling transmission by fomites is through proper cleaning and disinfection, use of barrier nursing precautions, separation of equipment, as well as the appropriate recognition and segregation of diseased animals.

Vector transmission: occurs when an insect or arthropod acquires a pathogen from one animal and transmits it to another. Fleas, ticks, flies and mosquitoes are common biological vectors of disease. The most effective means to prevent transmission of vector-borne is the elimination or reduction of the insect vector, or at a minimum, separation of the vector from the host.

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. Biosecurity is a set of preventive measures designed to reduce the risk of transmission of infectious diseases.
2. Direct contact transmission is requires an animal or person to directly contact another infected animal or person.

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

1. Which one of the following is not clinic security measures and infection control principles?
   A. Optimize clinic hygiene and fencing
   B. Break the transmission cycle of the disaese
   C. Target and refine infection control procedures
   D. Enhance education and aware of the community
   E. None of the above

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

You can ask your teacher for the copy of correct answers

Reference Materials

Book References

1. Formulary for laboratory animals 2nd edition, iowa state university press.
2. Handbook of Pharmaceutical Analysis
3. National Veterinary Drug Formulary, Department of Livestock Ministry of Agriculture and Forests https://mail.google.com/mail/u/0/#inbox/DmwnWrRpccpDnMGXTwzhrTkBZLxwhVLhmbvrdjQHvlFTzhRzfbWSWXLcdQxwQQHVCsnnqqCCfsSl?projector=1&messagePartId=0.1
4. Introduction in Veterinary Pharmacology. Electronic Course Support https://mail.google.com/mail/u/0/#inbox/CllgCKCJFVvKtPtpdfBJpNBvFrpSNZZnNQJLhCkhZdpkpdwHMqLmKfgShPJNVxVZTHbkQpCdzcg?projector=1&messagePartId=0.1
5. Veterinary manual, Administration of vaccine to animals https://www.msdvetmanual.com/pharmacology/vaccines-and-immunotherapy/administration-of-vaccines-in-animals
6. Prüss, A., E. Giroult, and P. Rushbrook (editors). 1999. Safe Management of Wastes from Health-Care Activities. Geneva: World Health Organization.
7. Guide to good farming practices for animal production food safety. World Organization for Animal Health. Rome, 2009
8. FAO/OIE/WHO (2003). Expert workshop on non-human antimicrobial resistance: scientific assessment. Geneva, Switzerland.
9. Hirsh DC, Zee YC (1999). Veterinary microbiology, 1st ed. Blackwell Publishing Company, California.
10. WHO (2001). Monitoring antimicrobial usage in food animals for the protection of human health. Reports of a WHO Consultation, Oslo, Norway.
11. Kanneene JB, Miller R (1997). Problems associated with drug residues in beef from feeds and therapy. Rev. Sci. Technol.
12. Itomir C, Silva D, Biljana A, Sanja C (2011). The significance of rational use of drugs in veterinary medicine for food safety. Technol. Mesa.
13. Encyclopedia of Pharmaceutical Technology. 2nd Ed. New York: Marcel Dekker INC, 3, 2004.
14. Blodinger J. Formulation of veterinary dosage forms, Drugs and pharmaceutical sciences.First Ed. New York: Marcel Dekker series,17,1983
15. McGraw-Hill, Basic and Clinical Pharmacology 9th ed 2003
16. Lullmann et al., Color atlas of pharmacology 2nd Ed.

17. Donal C. Phmbb Veterinary drug handbook 7th Edition 20
18. Guide to good storage practices for pharmaceuticals, WHO Technical Report Series, No. 908, 2003
19. Giordani, G et al., 2016 Mechanism of action of drugs with activity against multicellular parasites
20. Handbook of Occupational Hazards and Controls for Pharmacy Workers

Internet References

1. Veterinary Safety and Health: Hazard Prevention and Infection Control https://www.skillmaker.edu.au/workplace-safety-procedures-and-instructions/
2. Workplace safety procedures and instructionshttps://www.cdc.gov/niosh/topics/veterinary/hazard.html
3. Hazard and Incident Reporting procedure https://www.gs.unsw.edu.au/policy/documents/HS307.pdf
4. What is a Work Instruction? https://klariti.com/2017/06/17/what-is-a-work-instruction/
5. Follow safe work practices https://www.coursehero.com/file/56347100/Follow-safe-work-practicespdf/
6. Emergency procedures https://www.hse.gov.uk/toolbox/managing/emergency.htm

Emergency Management and Safety https://students.umw.edu/safety/safety

8. plan/chapter-chemical-storage-and-handling/
9. Prescription and dispensation of drugs for animal use. 201 BOARDS AND COMMISSIONS Chapter: \201\016.600 (ky.gov)
10. Guidelines for Veterinary Prescription Drugs https://cdn.ymaws.com/www.massvet.org/resource/resmgr/Pet_Owners/Guidelines_for_Veterinary_Pr.pdf
11. Guidelines for veterinary prescription drugs
12. Veterinary Prescription Drugs https://www.avma.org/resources-tools/avma-policies/guidelines-
13. Livestock Drug Safety Veterinary Drugs and Labels

http://wifss.ucdavis.edu/wpcontent/uploads/2015/FDA/fdacoursefinal1/Veterinary%20Drugs%20and%20Labels_new.pdf

14. Veterinary Drug Residue: The Risk, Public Health Significance and its Management https://juniperpublishers.com/jdvs/pdf/JDVS.MS.ID.555856.pdf
15. Similarities and Differences Between Brand Name and Generic Drugs https://www.cadth.ca/sites/default/files/pdf/similarities_differences_brandname_generic_drugs_e.pdf
16. Machine safety checklist https://polytron.com/wp-content/uploads/2015/04/Polytron-Machine-Safety-Checklist.pdf

17. Guidelines for Personal protective Equipment (ppe)
https://www.ehs.washington.edu/system/files/resources/ppeguidelines.pdf
18. Introductory Veterinary Pharmacology
https://mail.google.com/mail/u/0/#inbox/CllgCJTGmpDNDjbpZkPgGCZJBKSLXxDZzKjGjKQdtvFtPbwHCPVFkCqwGqQTCczCcGSZNsKwblB?projector=1&messagePartId=0.1
19. Vaccine and Drug Practices
https://mail.google.com/mail/u/0/#inbox/CllgCJlJVSJrwVXTrVNlRDnhJdCFRFKxpfmtHFJLRqBMXbxLHkkspZqqlwHpNKQfSCLHRmBpMrg?projector=1&messagePartId=0.1
20. Preparation and administration of me- dicaments body weight of animals and drug dosage
https://mail.google.com/mail/u/0/#inbox/GTvVlcRwPkcPSnGPXsJmXQClfwdtwHMZGdqRBLhCZFbzGCBJmjhJrRcrQltvXWXdHtclVlcrQwJH?projector=1&messagePartId=0.1
21. Fluid Therapy in Vomiting and Diarrhea
https://mail.google.com/mail/u/0/#inbox/CllgCJvqJvXvzPnjTrFqPzhbbpTsHjlpbBfXRhZKqCTBxGmxXJDrmHbcWwgJvjHBJCWHVdvnjqV?projector=1&messagePartId=0
22. Fluid Therapy in Small Ruminants and Camelid
https://mail.google.com/mail/u/0/#inbox/DmwnWstqwPRXlSjZFxxShDgtmJdMZdFmrMZtKRzHJWcXpqBwNMJvVjHBXsjRpvLVXNbdQVwcllwQ
23. Types of dosage forms and their definitions
https://mail.google.com/mail/u/0/#inbox/DmwnWtDpKSZpXCkKQQbNhGvqWTFrChhLCnLKMzzwSNdfrXdbTpnLLmmrMWXzgKgTrxVSwRkkDnLG?projector=1&messagePartId=0.1
24. IV Fluid Therapy Calculatio
25. https://mail.google.com/mail/u/0/#inbox/GTvVlcSMSckJzVdCLhVNvQKmBwjFhGfLWWtVsmQbpbGzQRwdDgJWZGBTBWcBNQMVXXWDZCqQXgjGf
26. Dehydration and fluid therapy
https://mail.google.com/mail/u/0/#inbox/jrjtXGkPPwzxsvhvxmnlrmmPbNTwKKlPRSllGdLBxXnfkttqJmJTgSlHxFXfttqpcJVVpwhL?projector=1&messagePartId=0.1
27. Fluid Therapy in Animals
http://www.pashudhanpraharee.com/fluid-therapy-in-animals/

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