Animal Health

Level-IV

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Module Title: - Conducting Prevention and Control of Animal Diseases

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Introduction to the Module

This module covers the knowledge, skills and attitude required to maintain safe animals' health through prevention, control and Strategic treatment of veterinary disease. It also includes Disease outbreak investigation and report writing and implementing safe and hygienic work practices.

LG #21	LO #1-Develop basic understanding on disease prevention and control

Instruction sheet 1

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

- Introduction to control, prevention and eradication of animal disease
- General methods of prevention and control of animal diseases
- Determinants and patterns of disease occurrence

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:

- Describe the concepts of control ,prevention and eradication of animal disease
- Identify General methods of prevention and control for common animal disease
- Explain determinants of disease occurrence and development
- Understand, identify, and characterize temporal patterns of disease occurrence in a population are understood

Learning Instructions:

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

Information Sheet 1

1.1 Introduction to control, prevention and eradication of animal disease

Terminology related to control, prevention and eradication of animal disease

- **Disease**: An abnormal condition or disorder that affects the normal functioning of an organism, including humans, animals, or plants.
- **Disease control**: The systematic efforts and measures taken to reduce the incidence, prevalence, and impact of diseases within a population or a specific geographic area.
- **Disease prevention**: The efforts and measures taken to reduce the risk of disease occurrence or the onset of a disease in individuals or populations
- **Eradication of a disease**: The permanent and deliberate elimination of a specific disease-causing agent or pathogen from a defined geographic area or from the entire global population.
- **Vaccination**: Preventive measure that involves the administration of a vaccine to stimulate the immune system and provide immunity against specific infectious diseases.
- **A vaccine**: A biological preparation that stimulates the immune system to provide protection against specific infectious diseases.
- **Pathogen**: A pathogen is a microorganism, such as a bacterium, virus, fungus, or parasite that can cause disease in its host.
- **Antigen**: It is foreign substance, usually a protein or a part of a protein, that can stimulate an immune response in the body.
- **Antibody (immunoglobulin)**: A protein produced by certain white blood cells (B cells) in response to the presence of specific antigens.
- **Lymphocytes**: Lymphocytes are a type of white blood cell that plays a central role in the immune response.
- **Phagocyte**: A type of cell, such as a neutrophil or a macrophage, that can engulf and destroy pathogens or other foreign substances through a process called phagocytosis.

- **Surveillance**: Systematic and ongoing collection, analysis, and interpretation of data related to the occurrence, distribution, and impact of diseases or other health-related events within a population.
- **Vector**: An organism, typically an arthropod (such as a mosquito, tick, or fly), that can transmit disease-causing pathogens from one host to another.
- **Host**: An organism that provides a habitat and resources for another organism, typically a parasite, symbiotic, or pathogen.
- **Quarantine**: Isolation and restriction of movement imposed on individuals, animals, or plants that may have been exposed to or are carrying infectious agents or pathogens.

1.2 General methods of prevention and control of animal diseases

- Controlling, preventing, and eradicating animal diseases are essential tasks to safeguard the health and well-being of animals, protect human health, and ensure the stability of food production systems
- The prevention and control of animal diseases involve various methods and strategies aimed at reducing the occurrence, spread, and impact of diseases in animals.
- Some general methods of prevention and control include:

I. Vaccination:

- Vaccination is a crucial preventive measure for many animal diseases.
- Vaccines stimulate the animal's immune system to develop immunity against specific pathogens.
- Vaccination programs are designed based on the target disease(s), the animal species involved, and the epidemiological situation.
- Regular vaccination can help prevent the onset of diseases and reduce their severity.

II. Biosecurity Measures:

- Biosecurity practices aim to prevent the introduction and spread of diseases within animal populations.
- This involves implementing measures to control and minimize the movement of animals, people, equipment, and vehicles.

- Biosecurity measures may include quarantine, isolation of sick animals, restricted access to farms, proper hygiene and sanitation practices, and disinfection of premises and equipment.

III. Disease Surveillance:

- Active disease surveillance involves systematic monitoring of animal populations to detect the presence of diseases.
- It involves regular testing, reporting, and analysis of data to identify disease outbreaks, determine disease prevalence, and guide control measures.
- Surveillance allows for early detection, rapid response, and targeted interventions.

IV. Diagnostic Testing:

- Diagnostic testing plays a vital role in disease prevention and control.
- It involves laboratory analysis of samples (e.g., blood, tissues, or swabs) from animals to confirm the presence of pathogens or detect specific disease markers.
- Accurate and timely diagnosis helps in identifying affected animals, implementing appropriate control measures, and preventing further spread.

V. Test and slaughter:

- Strategy used in the prevention and control of animal diseases, particularly those that can spread rapidly within a population.

VI. Quarantine and Movement Restrictions:

- Quarantine refers to the isolation of animals that have been exposed to a disease or are suspected of being infected. Quarantine measures help prevents the spread of diseases by restricting the movement of potentially infected animals.
- Movement restrictions may also be imposed on animals from disease-affected areas to prevent the introduction of diseases into disease-free regions.

VII. Vector Control:

- Some diseases are transmitted through vectors such as mosquitoes, ticks, or flies. Vector control measures aim to reduce or eliminate the vector population to interrupt disease transmission.
- This may involve insecticide application, habitat modification, use of repellents, or physical barriers to prevent vector access to animals.

VIII. Improvement in husbandry practices and feeding

- Can contribute significantly to the prevention and control of animal diseases which includes
  - ✓ Proper Nutrition,
  - ✓ Hygiene and Sanitation,
  - ✓ Animal Housing and Environment,
  - ✓ Preventive Veterinary Care,
  - ✓ Stress Reduction,
  - ✓ Monitoring and Early Detection,
  - ✓ Record Keeping

IX. Education and Awareness:

- Educating animal owners, farmers, and industry professionals about disease prevention and control measures is essential.
- This includes providing information on good animal husbandry practices, biosecurity measures, proper hygiene, and early disease recognition.
- Awareness campaigns can help promote responsible animal management and encourage early reporting of suspected diseases.

X. Treatment and Quarantine of Diseased Animals:

- Prompt treatment and isolation of diseased animals are crucial to prevent the spread of infectious diseases.
- Infected animals should receive appropriate veterinary care, and measures such as isolation facilities, proper waste disposal, and disinfection should be implemented to minimize disease transmission.

XI. Genetic improvement

- Plays a significant role in the prevention and control of animal diseases
- Contribute to disease prevention and control:
  - ✓ Selection for Disease Resistance
  - ✓ Genomic Selection
  - ✓ Crossbreeding and Hybrid Vigor:

- ✓ Selective Breeding for Immune Response
- ✓ Genetic Testing and Screening
- ✓ Genetic Diversity Preservation

1.3. Determinants and patterns of disease occurrence

1.3.1. Determinants of disease occurrence

- The occurrence of diseases is influenced by various determinants and follows specific patterns. These determinants and patterns can provide insights into the factors that contribute to disease occurrence and help guide prevention and control efforts.
- Key determinants and patterns of disease occurrence:
  - ✓ **Host Factors:** The characteristics of the host population, including
    - **Genetics:** Certain genetic traits may make individuals more susceptible or resistant to specific diseases.
    - **Age:** Age can affect disease vulnerability, with certain diseases being more prevalent in specific age groups
    - **Sex:** Some diseases may have a higher incidence or severity in one sex compared to the other. This can be due to differences in hormonal profiles, anatomical characteristics, or behaviors between males and females. For instance, reproductive-related diseases may predominantly affect females, while certain infectious diseases may exhibit sex-specific patterns due to differences in immune responses.
    - **Immune status**: Animals with compromised immune systems, such as those with underlying diseases, stress, or malnutrition, are often more susceptible to infections. Immune status can also influence the severity and duration of diseases. Additionally, the presence of pre-existing immunity, either through vaccination or prior exposure, can impact disease occurrence patterns by reducing susceptibility or modifying disease outcomes.
    - **Behavior and Social Factors**: Host behavior and social factors can influence disease occurrence patterns. For example, the density and mixing of animals

within a population can affect disease transmission rates. Animal movement, such as migration or trade, can introduce or spread diseases across different geographic areas. Social behaviors, such as communal roosting or mating practices, can facilitate the spread of certain infections. Understanding the behavioral and social dynamics of animal populations is crucial for predicting and managing disease outbreaks.

- **Population Density and Interactions**: The density and interactions of animals within a population can influence disease occurrence patterns. High-density populations, such as intensive farming systems or overcrowded environments, can facilitate the rapid spread of contagious diseases. Social interactions, such as grooming, mating, or aggression, can provide opportunities for disease transmission. Understanding population dynamics and implementing appropriate management practices are crucial for controlling disease spread.

✓ **Environmental Factors:** Environmental factors play a significant role in disease occurrence. These include physical factors such as

- Climate,
- geography, and
- Habitat, as well as social and economic factors such as living conditions, access to clean water and sanitation, and socioeconomic status.

✓ **Pathogen Factors:** Play a significant role in the patterns of animal disease occurrence.

- Key pathogen factors and their patterns in animal disease occurrence:
  - » **Virulence and Pathogenicity**: Pathogens vary in their ability to cause disease, known as virulence, and the severity of the disease they produce, known as pathogenicity. Some pathogens are highly virulent, causing severe disease with high morbidity and mortality rates. Others may be less virulent, resulting in milder or subclinical infections. The level of virulence can influence the pattern and intensity of disease outbreaks within animal populations.

- **Transmission Modes**: Pathogens employ various modes of transmission to spread from one host to another. These modes include direct contact, aerosol transmission, vector-borne transmission (e.g., through mosquitoes or ticks), oral-fecal transmission, and vertical transmission (from mother to offspring). The transmission mode affects the speed and efficiency of disease spread and can result in different patterns of disease occurrence. For example, diseases transmitted through direct contact may exhibit higher rates of spread in densely populated animal groups.
- **Host Range and Specificity**: Pathogens can exhibit different host ranges and specificities. Some pathogens have a broad host range, infecting multiple animal species, while others are more host-specific. The host range and specificity influence the susceptibility of different animal species and populations to infection. Diseases with a broad host range may have wider distribution and can potentially spill over to humans or other animal species, leading to zoonotic diseases.
- **Pathogen Evolution and Adaptation:** Pathogens can evolve and adapt to their hosts and environments, leading to changes in their characteristics and disease patterns. Genetic mutations, recombination, and selection pressures can shape pathogen populations over time. These changes can lead to the emergence of new strains or variants that may have altered virulence, transmission capabilities, or host ranges. Monitoring pathogen evolution is crucial for early detection and response to emerging diseases.
- **Endemic and Epidemic Patterns:** Pathogens can exhibit endemic or epidemic patterns of occurrence. Endemic diseases maintain a relatively stable presence within a population or geographic area, with periodic fluctuations. Epidemics refer to the occurrence of a disease at a higher-than-normal frequency and intensity within a specific population or region. Epidemics can be triggered by factors such as introduction of new strains, changes in host susceptibility, or breakdown of control measures.

Note: Generally whether or not disease occurs in an individual depend often on interplay of three things which are Host, agent, and environment and it is called Epidemiological triad.

1.3.2. Patterns of disease occurrence

- Understanding the patterns of disease occurrence is important for public health planning, surveillance, and control measures. Here are some common disease patterns of occurrence, supported by references:
- There are several types of patterns of disease occurrence that can be observed. Here are some common types:

A. Endemic Diseases:

- It is the consistent and persistent presence of a disease within a specific population or geographic area.
- "The term "endemic" indicates that the disease is established and consistently found in a specific region or population.
- It implies that the disease is continuously present at a relatively stable level over time, without significant fluctuations.
- Endemic diseases often exhibit a relatively stable level of transmission and prevalence within the defined area or population.
- The factors contributing to the endemicity of a disease can include:
  - ✓ The presence of a suitable reservoir,
  - ✓ The presence of a competent vector or intermediate host,
  - ✓ Environmental conditions, and
  - ✓ Host factors such as immunity or genetic susceptibility.

B. The epidemic pattern of disease occurrence

- It is the occurrence of a disease at a higher-than-normal frequency and intensity within a specific population or geographic area.
- It often involves a rapid increase in the number of cases, exceeding what is typically expected.
- Epidemics can result from various factors, such as
  - ✓ The introduction of a new pathogen,

- ✓ Changes in host susceptibility,
- ✓ Breakdown of control measures, or
- ✓ Other environmental and social factors.

- Understanding the patterns and dynamics of epidemics is crucial for effective disease surveillance, prevention, and response efforts.
- Epidemics can be localized or global in scale, and they often involve the rapid spread of a disease within a specific population or geographic area.

C. Sporadic pattern of disease occurrence

- It is the occurrence of isolated cases or small clusters of a disease that appear irregularly and unpredictably in a population or geographic area.
- Sporadic cases are not part of a larger outbreak or epidemic and do not demonstrate a consistent or continuous pattern of occurrence.
- Sporadic cases as "occasional cases occurring at irregular intervals" and distinguishes them from epidemic or endemic cases.
- Sporadic cases are isolated occurrences that do not indicate ongoing transmission or a continuous presence of the disease within a population or area.
- Cause of sporadic pattern of disease occurrence
  - ✓ Random Exposure
  - ✓ Environmental Factors
  - ✓ Individual Susceptibility
  - ✓ Occupational or Hobby-related Exposures
  - ✓ Travel-related Exposures
  - ✓ Reporting and Surveillance Bias

D. The pandemic pattern of disease occurrence

- It is the global or widespread occurrence of a disease, affecting multiple countries or continents and often involving a significant number of cases and widespread transmission.
- The term is used when a new infectious disease emerges and spreads across different countries or continents, affecting a large number of people.

Self-check 1	Written test

Name_____ ID _____Signature_____ Date_____

Directions: Answer all the questions accordingly.

Part I: Write true if the statement is correct and false if the statement is incorrect (8 points)

1. Genetics can influence an individual's susceptibility to specific diseases._____
2. High population density can facilitate the rapid spread of contagious diseases. _____
3. Pathogens with a broad host range have a higher likelihood of causing zoonotic diseases. _____
4. Environmental factors, such as climate and geography, can play a role in disease occurrence._____
5. Epidemics refer to the occurrence of a disease at a higher-than-normal frequency and intensity within a specific population or region. _____
6. Endemic diseases are characterized by the consistent and persistent presence of a disease within a specific population or geographic area. _____
7. Epidemics involve a rapid increase in the number of cases, exceeding what is typically expected. _____
8. Sporadic cases of a disease demonstrate a consistent or continuous pattern of occurrence. _____

Part II: Choose the best answer by encircling 10 points)

1. Which preventive measure stimulates the animal's immune system to develop immunity against specific pathogens?

A. Biosecurity measures
C. Test and slaughter
B. Disease surveillance
D. Vaccination

2. What do biosecurity practices aim to prevent within animal populations?

A. Disease outbreaks
C. Genetic improvement
B. Vaccination side effects
D. Introduction and spread of diseases

3. What does disease surveillance involve?

A. Laboratory analysis of samples
B. Monitoring animal populations for diseases

C. Isolation of sick animals
D. Movement restrictions on animals

4. What is the purpose of diagnostic testing in disease prevention and control?

A. Preventive care for animals
B. Isolation of sick animals
C. Confirmation of disease presence or specific markers
D. Implementation of quarantine measure

5. Which strategy involves the isolation of animals that have been exposed to a disease or are suspected of being infected?

A. Diagnostic testing
B. Vaccination programs
C. Quarantine
D. Genetic improvement

6. What do vector control measures aim to reduce or eliminate?

A. Animal populations
B. Disease prevalence
C. Vector population
D. Quarantine measures

7. How can improvement in husbandry practices and feeding contribute to disease prevention and control?

A. By promoting early disease recognition
B. By reducing genetic diversity
C. By implementing quarantine measures
D. By providing proper nutrition and hygiene

8. What is the role of education and awareness in disease prevention and control?

A. Implementing biosecurity measures
B. Treating and isolating diseased animals
C. Promoting responsible animal management and early disease recognition
D. Developing new prevention and control methods

9. Which measure involves the prompt treatment and isolation of diseased animals to prevent disease spread?

A. Genetic improvement
B. Biosecurity measures
C. Vector control
D. Treatment and quarantine of diseased animals

10. What do regulatory measures aim to prevent and control?

A. Genetic diversity preservation
B. Introduction and spread of diseases
C. Research and development
D. Early disease recogniti

Part III: Writ Short Answer for the following Questions In the space provided (3 Points)

1. What is the term that refers to the systematic efforts and measures taken to reduce the incidence, prevalence, and impact of diseases within a population or a specific geographic area?_____
2. What term describes the permanent and deliberate elimination of a specific disease-causing agent or pathogen from a defined geographic area or from the entire global population?

   _____
3. What is the term used to describe an organism, typically an arthropod, that can transmit disease-causing pathogens from one host to another?

   _____

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

LG #22	LO #2-Apply bio-security protocols to people, animals and equipment

Instruction sheet 2

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

- Component, threats and principles of biosecurity
- Sources of contamination entering work area
- Apply Footbath at farm and sheds area

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:

- Understand and describe principles and component's bio-security
- Identify possible sources of pathogen contamination entering work area
- Identify potential bio security threats on the enterprise
- Keep farm compound footbaths and areas around sheds clear of debris according to workplace policy.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks

Information Sheet 2

2.1. Component, threats and principles of biosecurity

2.1.1. Component of biosecurity

A. Isolation

- A crucial component of biosecurity measures for disease prevention.
- It involves physically separating animals that are infected or potentially carrying a disease from healthy individuals to prevent the spread of the disease.
- Isolation measures can be animal production facilities.
- Some key roles of isolation in biosecurity for disease prevention
  - ✓ **Containment of Infected Individuals:**
    - Isolation helps contain infected animals, preventing them from coming into contact with healthy animals and reducing the risk of disease transmission.
    - Isolation units or rooms with specific infection control protocols may be utilized to isolate patients with contagious diseases.
  - ✓ **Minimization of Disease Spread:**
    - Isolation measures effectively minimize the spread of diseases by limiting contact and reducing opportunities for pathogens to spread from infected individuals to susceptible populations.
    - This is particularly important for highly contagious diseases or those with airborne transmission.
  - ✓ **Protection of Vulnerable Populations:**
    - Isolation is essential for protecting vulnerable populations, such as immune-compromised individuals, newborns, or elderly individuals who may be more susceptible to severe complications from infectious diseases.
    - By isolating infected individuals, the risk of exposure to these vulnerable groups is significantly reduced.
  - ✓ **Prevention of Disease Outbreaks:**

- Isolation plays a key role in preventing disease outbreaks in animal production facilities, such as farms or aquaculture operations.
- Infected animals can be isolated to prevent the spread of diseases within the herd or flock, minimizing economic losses and ensuring the health and welfare of the animals.

✓ **Quarantine Measures:**

- Quarantine is a specific form of isolation used to restrict the movement of individuals, animals, or plants that may have been exposed to a disease but are not yet showing symptoms.
- Quarantine allows for observation and testing to determine if an infection is present before allowing movement or integration with healthy populations.

- Implementing effective isolation measures requires adherence to biosecurity protocols, including
  - ✓ Proper facility design,
  - ✓ Use of personal protective equipment (PPE),
  - ✓ Regular cleaning and disinfection, and strict adherence to isolation procedures

B. Movement controls

- It is an essential component of animal disease control and prevention strategies.
- These controls aim to restrict the movement of animals to prevent the spread of diseases
- Common movement control measures used in animal disease control and prevention:

✓ **Quarantine:**

- Prevents the movement of potentially infected animals and allows for observation, testing, and diagnosis before allowing their integration into healthy populations.

✓ **Movement Restrictions:**

- Can be imposed on specific geographic areas or premises to limit the movement of animals in or out of the affected areas.
- This helps contain the disease and prevent its spread to unaffected regions.
- Movement restrictions may include zoning, control zones, or surveillance zones.

- ✓ Animal Movement Licensing:
  - It involves a permit or authorization process for the movement of animals.
  - This allows regulatory authorities to track and monitor animal movements, ensuring compliance with disease control measures.
  - Licensing may include requirements for veterinary health certificates or testing prior to movement.
- ✓ Traceability Systems:
  - Implementing robust animal traceability systems enables the identification and tracking of individual animals or groups throughout their lifespan.
  - Traceability systems help in quickly identifying and locating potentially affected animals in the event of a disease outbreak, facilitating rapid response and control measures.
- ✓ Border Controls:
  - Involve regulations and inspections at national or regional borders to prevent the introduction of diseases through the importation of animals, animal products, or biological materials.
  - These controls include customs inspections, quarantine facilities, and health certification requirements for imported animals.
- ✓ Movement Standstills:
  - Also known as animal movement bans, can be imposed during disease outbreaks to halt all non-essential movements of animals.
  - This helps reduce the risk of disease transmission and allows authorities to assess the situation, implement control measures, and prevent further spread.
- ✓ Surveillance and Testing:
  - Surveillance programs can be implemented to monitor and detect the presence of diseases in animal populations.
  - This may involve regular testing of animals within specific areas or targeted testing of high-risk groups.
  - Surveillance data helps inform movement control decisions.

C. Disinfection and sanitation

- Disinfection and sanitation practices play a critical role in animal disease control and prevention.
- They help to eliminate or reduce the presence of pathogens in the environment, thereby reducing the risk of disease transmission.
- **Some key aspects of disinfection and sanitation in animal disease control:**
  - ✓ Cleaning: Thorough cleaning is an essential first step in the disinfection process. It involves the removal of organic matter, such as manure, dirt, or bedding, from surfaces, equipment, and facilities. Cleaning helps to eliminate potential sources of pathogens and prepares the surfaces for effective disinfection.
  - ✓ Disinfection:
    - It involves the use of chemical agents or physical methods to kill or inactivate pathogens on surfaces, equipment, and facilities.
    - Different disinfectants may be used depending on the target pathogens and the specific requirements of the situation.
    - It is important to follow the manufacturer's instructions for proper dilution, contact time, and application methods.
  - ✓ High-Risk Areas:
    - Paying particular attention to high-risk areas is crucial for effective disinfection and sanitation.
    - These areas may include animal housing facilities, equipment used for animal handling, common areas where animals congregate, and areas with known disease outbreaks.
    - Thorough disinfection of these areas helps to break the disease transmission cycle.
  - ✓ Equipment and Tools:
    - Regular disinfection and sanitation of equipment and tools used in animal care, such as feeders, waters, and grooming supplies, is important to prevent cross-contamination between animals and minimize the risk of disease spread.

- ✓ Biosecurity Measures: Disinfection and sanitation should be integrated into overall biosecurity measures. This includes
  - Implementing practices such as footbaths or vehicle disinfection at entry points to prevent the introduction of pathogens onto the premises and employing strict protocols to prevent the movement of pathogens between different areas or groups of animals.
- ✓ Water Sources:
  - Ensuring the cleanliness and safety of water sources is vital for animal health.
  - Regular testing and treatment of water supplies, including disinfection if necessary, help to prevent the transmission of waterborne diseases.

2.1.2. Threats of biosecurity

- Biosecurity measures in animal disease control and prevention are vital for preventing the spread of infectious diseases among animals.
- However, they can also present certain threats and challenges.
  - ✓ Economic Impact:
    - Strict biosecurity measures can have significant economic consequences for the livestock industry.
    - Quarantine protocols, movement restrictions, and trade bans can disrupt domestic and international trade, leading to financial losses for farmers and businesses.
  - ✓ Trade Restrictions:
    - Intensified biosecurity measures, such as import bans or stringent certification requirements, can limit international trade of animals and animal products.
    - These restrictions can hinder market access and impact the livelihoods of farmers and exporters.
  - ✓ Compliance Challenges:
    - Implementing and enforcing biosecurity measures can be challenging, particularly in large-scale livestock operations or regions with limited resources.
    - Ensuring widespread compliance with biosecurity protocols requires education, training, and adequate infrastructure.
  - ✓ Social and Ethical Concerns:

- Biosecurity measures can raise social and ethical concerns related to animal welfare, such as restrictions on animal movement, confinement practices, and depopulation strategies.

✓ Genetic Diversity:

- Strict biosecurity measures, such as import restrictions on breeding animals, can limit genetic diversity within livestock populations.
- Overreliance on a limited gene pool can increase the susceptibility of livestock to diseases and reduce adaptability.

- It is important to note that while these threats exist, biosecurity measures are crucial for preventing and controlling the spread of animal diseases.

2.1.3. Principles of biosecurity

- Biosecurity principles play a crucial role in animal disease control and prevention.
- These principles aim to minimize the introduction and spread of infectious diseases within animal populations.
- Here are some fundamental principles of biosecurity:

✓ Risk Assessment:

- Conducting a thorough risk assessment is the first step in developing an effective biosecurity plan.
- This involves identifying potential sources of diseases, assessing the likelihood of introduction, and evaluating the potential consequences.
- Understanding the specific risks helps tailor biosecurity measures to address the most significant threats.

✓ Disease Surveillance:

- Implementing a robust disease surveillance system is essential for early detection and monitoring of diseases.
- Regular monitoring of animals, including clinical observation and diagnostic testing, helps in identifying any abnormal health trends or disease outbreaks.
- Information gathered through surveillance enables timely response and implementation of appropriate control measures.

- ✓ Biosecurity Zones and Segregation:
  - Establishing biosecurity zones and implementing segregation measures are vital for preventing disease transmission.
  - Biosecurity zones can be created based on the level of disease risk, and access controls should be implemented to minimize movement between zones.
  - Segregation involves keeping different animal groups separate to prevent direct or indirect contact, reducing the risk of disease transmission.
- ✓ Bio-containment:
  - Bio containment measures aim to prevent the escape of infectious agents from an infected area or facility.
  - It involves implementing physical barriers, such as fences, walls, or enclosures, to contain infected animals and limit their contact with susceptible animals.
  - Adequate bio containment measures help prevent the spread of diseases within and beyond the affected area.
- ✓ Hygiene and Sanitation:
  - Maintaining proper hygiene and sanitation practices is essential for minimizing disease transmission.
  - This includes regular cleaning and disinfection of animal housing, equipment, and vehicles.
  - Personal hygiene practices, such as hand washing and wearing protective clothing, should be followed by individuals handling animals to prevent the spread of pathogens.
- ✓ Animal Movements and Biosecurity Protocols:
  - Implementing strict protocols for animal movements is critical for preventing the introduction and spread of diseases.
  - This involves monitoring and controlling the movement of animals onto and off the premises, including quarantine procedures for newly introduced animals.
  - Adhering to import/export regulations and certification requirements helps minimize the risk of introducing diseases across borders.

- ✓ Education and Training:
  - Educating and training animal owners, farmers, and animal caretakers on biosecurity measures is essential for their effective implementation.
  - Providing knowledge about disease risks, proper biosecurity practices, and the importance of early detection and reporting of diseases helps build awareness and compliance.
- ✓ Collaboration and Communication:
  - Effective communication and collaboration among stakeholders, including farmers, veterinarians, government agencies, and research institutions, are crucial for successful disease control and prevention.
  - Sharing information, coordinating response efforts, and fostering partnerships contribute to a coordinated approach in managing animal diseases.

2.1.4. Chemicals for disinfection and sanitation in animal disease control and prevention

- There are various chemicals that can be used for disinfection and sanitation in animal disease control and prevention.
- The choice of chemical will depend on factors such as the target pathogens, the specific surfaces or equipment being treated, and any regulatory requirements.
- Here is a list of commonly used chemicals for disinfection and sanitation:
  - ✓ Quaternary Ammonium Compounds (Quats):
    - Examples include benzalkonium chloride, dodecylbenzenesulfonic acid, and alkyl dimethyl benzyl ammonium chloride. Quats are effective against a broad range of bacteria, viruses, and fungi.
    - They are commonly used for surface disinfection in animal housing facilities.
  - ✓ Phenolic Compounds:
    - Examples include orthophenylphenol (OPP) and cresols. Phenolics have a broad spectrum of activity against bacteria, viruses, and fungi.
    - They are often used for disinfection in areas with high organic load, such as animal stalls and barns.

- ✓ Sodium Hypochlorite:
  - Commonly known as bleach, sodium hypochlorite is effective against a wide range of microorganisms.
  - It is used for surface disinfection and water treatment in animal facilities.
  - It is important to follow proper dilution ratios and contact times when using bleach.
- ✓ Hydrogen Peroxide:
  - Antimicrobial properties and can be used for disinfection of surfaces and equipment.
  - It is effective against bacteria, viruses, and fungi.
  - It is less toxic and leaves no residue, making it suitable for use in certain situations.
- ✓ Iodine Compounds:
  - Iodine-based disinfectants, such as povidone-iodine or iodophors, are effective against bacteria, viruses, and some fungi.
  - They can be used for disinfection of surfaces, equipment, and wounds.
- ✓ Glutaraldehyde: Glutaraldehyde
  - A powerful disinfectant effective against a wide range of microorganisms, including bacteria, viruses, and fungi
  - It is commonly used for equipment disinfection in veterinary clinics and animal research facilities.
- ✓ Peracetic Acid:
  - A strong oxidizing agent with broad-spectrum antimicrobial activity
  - It is effective against bacteria, viruses, fungi, and spores.
  - Commonly used for equipment and surface disinfection in animal healthcare settings.
- ✓ Chlorhexidine:
  - An antiseptic agent that can be used for disinfection and wound care.
  - It has broad-spectrum activity against bacteria, viruses, and fungi.
  - Often used for preoperative skin disinfection and wound irrigation.

- Always follow the manufacturer's instructions for proper dilution, contact time, and safety precautions when using disinfectants.

2.2. Sources of contamination entering work area

- Contaminants can compromise disease control and prevention efforts by increasing the risk of disease transmission and interfering with the effectiveness of control measures.

2.2.1. List of contaminants that reduce disease control and preventions

- List of contaminants that can reduce disease control and prevention:
  - ✓ **Pathogens**: microorganisms, such as bacteria, viruses, fungi, and parasites, that causes disease in animals.
  - ✓ **Organic Material**: such as manure, urine, blood, and saliva, can harbor and facilitate the survival and transmission of pathogens. These materials contain a high load of microorganisms and can contaminate the environment, equipment, and surfaces, increasing the risk of disease spread.
  - ✓ **Contaminated Water**: Water contaminated with pathogens can serve as a source of disease transmission.
  - ✓ **Contaminated Feed**: Pathogens can contaminate feed during production, storage, or transportation.
  - ✓ **Vectors**: Vectors, such as insects and ticks, can transmit pathogens between animals. They can act as carriers of diseases, mechanically transferring pathogens from infected to susceptible animals.
  - ✓ **Contaminated Equipment and Tools**: Equipment and tools used in animal handling, sample collection, and procedures can become contaminated with pathogens. If not properly cleaned and disinfected, these items can serve as a source of disease transmission between animals.
  - ✓ **Poor Biosecurity Practices**: Inadequate implementation of biosecurity measures can contribute to disease transmission. Lack of proper hygiene practices, insufficient control of animal movements, and failure to implement biosecurity protocols can increase the risk of disease introduction and spread.

- ✓ **Environmental Contaminants**: such as chemicals, pollutants, and toxins, can compromise animal health and weaken the immune system, making animals more susceptible to diseases.

2.2.2. Source of contaminates

- Contamination can pose a significant risk in animal disease control and prevention efforts.
- It is important to identify potential sources of contamination to implement appropriate measures to prevent the entry of pathogens into work areas.
- Here are some common sources of contamination:
  - ✓ **Personnel and Visitors**: Proper hygiene practices, such as hand washing, wearing protective clothing, and footwear sanitation, are crucial for preventing the transmission of pathogens.
  - ✓ **Contaminated Equipment and Tools**:
    - Proper cleaning and disinfection protocols should be followed to prevent the transfer of contaminants from one animal or area to another.
    - Regular maintenance and inspection of equipment are also important to ensure their effectiveness.
  - ✓ **Vehicles and Transport**:
    - Vehicles used for transporting animals, feed, or other materials can serve as potential sources of contamination.
    - Implementing biosecurity protocols for vehicle entry and exit, including vehicle disinfection, can help minimize the risk of contamination.
  - ✓ **Feed and Water**:
    - Contaminated feed and water can introduce pathogens into animal populations.
    - Proper storage and handling of feed to prevent contamination, as well as ensuring a clean and safe water supply, are essential biosecurity measures.
    - Regular monitoring and testing of feed and water sources can help identify potential risks.
  - ✓ **Wildlife and Vectors**:

- Wildlife species and vectors, such as insects or rodents, can carry and transmit pathogens to animals.
- Implementing measures to minimize wildlife access to animal areas, such as fencing, pest control, and surveillance, can help reduce the risk of disease transmission.

✓ **Environmental Contamination**:

- The environment itself can serve as a reservoir for pathogens, especially in areas where infected animals have been present.
- Proper cleaning and disinfection of animal housing, equipment, and premises are essential to reduce environmental contamination and subsequent disease transmission.

2.3. Apply Footbath at farm and sheds area

- Using footbaths at farms and sheds is a common biosecurity measure to help prevent the introduction and spread of diseases.
- Footbaths are containers filled with a disinfectant solution that individuals walking into or out of a designated area must step into to disinfect their footwear, reducing the risk of pathogen transmission.

2.3.1. Guidelines for implementing footbaths effectively

✓ **Placement:**

- Place footbaths at strategic locations where they can be easily accessed by individuals entering or exiting the designated area.
- This can include entry and exit points of barns, poultry houses, or other animal housing areas.
- Ensure that the footbaths are placed on a stable and level surface to prevent spills and accidents.

✓ **Size and Design:**

- Footbaths should be appropriately sized to accommodate the footwear of individuals.

- They should be deep enough to cover the sole and lower part of the footwear, allowing for sufficient contact with the disinfectant solution.
- The footbaths should be designed to prevent the solution from splashing or spilling out during use.

✓ **Disinfectant Solution:**

- Prepare a suitable disinfectant solution for the footbath. Choose a disinfectant recommended for the specific pathogens of concern.
- Common disinfectants used in footbaths include quaternary ammonium compounds, iodine-based solutions, or chlorine-based products.

✓ **Maintenance:**

- Regularly monitor and maintain the footbaths to ensure their effectiveness.
- Replace the disinfectant solution regularly or when it becomes visibly dirty or diluted. Clean the footbath containers and surfaces to remove any organic material that may reduce the disinfectant's efficacy.
- Keep the footbaths covered when not in use to prevent contamination or evaporation of the disinfectant solution.

✓ **Education and Compliance:**

- Educate individuals about the importance of using footbaths and provide clear instructions on proper usage.
- Emphasize the need for everyone to comply with the footbath protocol, including workers, visitors, and contractors.
- Regularly remind individuals to use the footbaths and monitor compliance to maintain biosecurity standards.

✓ **Supplementary Measures:**

- While footbaths can be a useful biosecurity tool, they should be used in conjunction with other preventive measures.
- This includes practicing good hygiene, such as hand washing, using personal protective equipment (PPE), implementing proper sanitation and cleaning protocols, and adhering to overall biosecurity practices

2.3.2. Chemicals for footbaths

- Several chemicals can be used as disinfectants in footbaths to help prevent the spread of diseases.
- The choice of chemical will depend on the specific pathogens of concern.
- Here are some commonly used chemicals for footbaths:
  - ✓ Quaternary Ammonium Compounds (QACs):
    - Such as benzalkonium chloride and dodecylbenzenesulfonic acid, are effective against a wide range of bacteria, viruses, and fungi.
    - They are commonly used in footbaths due to their broad-spectrum antimicrobial properties and relative safety for humans and animals.
  - ✓ **Iodine-Based Solutions:**
    - Such as iodophors or povidone-iodine solutions, are effective against various pathogens, including bacteria, viruses, and fungi.
    - They have good penetration and residual activity but may stain surfaces and have certain limitations in the presence of organic matter.
  - ✓ **Hydrogen Peroxide:**
    - A broad-spectrum disinfectant effective against bacteria, viruses, and fungi.
    - It is less toxic compared to some other chemicals and can degrade into water and oxygen, leaving no harmful residues.
    - However, hydrogen peroxide may have reduced efficacy in the presence of organic matter and may require higher concentrations for effective disinfection.

2.3.3. Factor affecting proper effectiveness of footbath chemicals

- **Dilution Rates:** Dilution rates may vary depending on the desired concentration and the intended use of the disinfectant.
- **Contact Time:**
  - ✓ The duration for which the disinfectant needs to remain in contact with the surface or footwear to effectively kill or inactivate pathogens.
  - ✓ Ensure that the contact time recommended by the manufacturer is followed to achieve optimal disinfection.
- **Organic Matter:**

- ✓ Keep in mind that the presence of organic matter, such as manure or dirt, can interfere with the effectiveness of disinfectants.
- ✓ Some disinfectants may require higher concentrations or longer contact times in the presence of organic matter.
- ✓ Proper cleaning of footwear and removal of visible organic material before using the footbath can enhance disinfectant efficacy

Self-Check 2	Written test

Name_____ ID _____Signature_____ Date_____

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

1. Isolation is an important component of biosecurity measures for disease prevention.
2. Isolation helps contain infected animals and prevent the spread of diseases.
3. Movement controls aim to promote the unrestricted movement of animals to prevent the spread of diseases.
4. Disinfection and sanitation practices are essential for reducing the risk of disease transmission.
5. Cleaning is not necessary before the disinfection process.

Part II: choices the correct answer (1pt each)

- Which of the following is a common source of contamination in animal disease control?

A. Proper hygiene practices
C. Wildlife and vectors
B. Regular maintenance of equipment
D. Vehicle disinfection

- Contaminated feed and water can introduce pathogens into animal populations through:

A. Improper storage and handling
C. Personnel and visitors
B. Wildlife access to animal areas
D. Environmental contamination

- What can serve as potential sources of contamination in animal disease control?

A. Proper cleaning and disinfection protocols
C. Contaminated equipment and tools
D. Vehicle entry and exit protocols
B. Regular monitoring of feed and water sources

- Which of the following can carry and transmit pathogens to animals?

A. Environmental contamination
C. Regular maintenance of equipment
B. Wildlife species
D. Personnel and visitors

- Proper cleaning and disinfection of animal housing, equipment, and premises are essential to reduce:

A. Proper storage and handling of feed
B. Environmental contamination
C. Wildlife access to animal areas
D. Vehicle

Part III: Short Answer Questions (1pts each)

1. What are footbaths used for in animal disease control?
2. What factors should be considered when placing footbaths?
3. Name three commonly used disinfectants for footbaths.
4. What should be done to maintain the effectiveness of footbaths?
5. How can the effectiveness of footbath chemicals be affected?

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

LG #23	LO3 # - Identify and implement Prophylaxis's measures

Instruction sheet 3
This learning guide is developed to provide you the necessary information regarding the following content coverage and topics: • Preventive prophylactic measures of common agents • Deworming strategy and implement treatments This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to: • Identify and apply preventive prophylactic measures to common bacterial viral and protozoan disease based on veterinarians recommendation • Implement strategic deworming and integrated treatment to minimize the risk of parasite on animal production and drug resistance.
Learning Instructions: 1. Read the specific objectives of this Learning Guide. 2. Follow the instructions described below. 3. Read the information written in the information Sheets 4. Accomplish the Self-checks

Information Sheet 3

3.1. Preventive prophylactic measures of common agents

- Preventive and prophylactic measures play a crucial role in controlling and managing animal diseases.
- Common strategies and reference points for preventing the spread of animal diseases:
  - ✓ **Biosecurity**: Implementing strict biosecurity measures is essential to prevent the introduction and spread of infectious agents. Biosecurity protocols may include:
    - Isolation and quarantine: Isolating new or sick animals from the rest of the herd or flock can prevent the spread of contagious diseases.
    - Restricted access: Limiting access to farms and animal facilities helps control the movement of people, animals, and equipment, reducing the risk of disease introduction.
    - Hygiene practices: Implementing proper sanitation and hygiene protocols, including hand washing, disinfection of equipment, and cleaning of animal premises, helps reduce the transmission of pathogens.
    - Pest control: Controlling pests such as rodents and insects can prevent the transmission of diseases they may carry.
    - Animal movements and transportation: Monitoring and regulating the movement of animals, including strict controls on imports and exports, can prevent the introduction and spread of diseases across regions.

- ✓ **Antibiotics**: Antibiotics are used in prophylactic measures for bacterial diseases or as part of treatment protocols
- ✓ Prophylactic measures for parasitic diseases often involve the use of antiparasitic agents. These agents may include ant-helminthic (dewormers) for internal parasites and acaricides for external parasites like ticks and fleas.
- ✓ **Nutritional Supplements:** Proper nutrition plays a vital role in maintaining animal health and reducing the risk of diseases. Nutritional supplements, such as vitamins, minerals, and

probiotics, can support the immune system and overall animal well-being. The specific supplements and their dosages depend on the animal species, age, and nutritional requirements. Consult with a veterinary nutritionist or veterinarian for advice on appropriate nutritional supplementation

✓ **Surveillance and monitoring:**

- Regular surveillance of animal populations is crucial for early detection and control of diseases.
- Veterinary authorities and organizations maintain surveillance systems to monitor disease prevalence, detect outbreaks, and implement appropriate control measures.
- Surveillance may involve active monitoring, passive reporting, laboratory testing, and data analysis.

✓ **Hygienic practices in animal husbandry:** Proper management practices within animal husbandry systems help maintain animal health and prevent disease transmission. These practices may include:

- Adequate nutrition: Providing animals with a balanced diet and appropriate feed helps support their immune function and overall health.
- Clean water supply: Ensuring a clean and reliable source of water for animals reduces the risk of waterborne diseases.
- Sanitary housing conditions: Maintaining clean and well-ventilated housing facilities helps prevent the buildup and spread of pathogens.
- Animal welfare: Ensuring proper handling, low-stress environments, and appropriate living conditions can help minimize disease susceptibility.

I. Education and training:

- Raising awareness among animal owners, farmers, and veterinary professionals about disease prevention, recognition, and control measures is essential.

- Educational programs, workshops, and training sessions can empower individuals to implement preventive measures effectively and take appropriate actions in case of disease outbreaks.

3.2. Deworming strategy and implement treatments

- Deworming is an important strategy to control and prevent parasitic infections in both humans and animals.
- The specific deworming strategy and treatment implementation can vary depending on the target species and the type of parasites involved.
- Deworming strategies for animals includes:

A. Integrated treatments

- Involve the use of multiple strategies and approaches to effectively manage and mitigate the spread of diseases among animals. These integrated treatments often encompass:
  - ✓ **Chemoprophylaxis:** For animal disease control and prevention involves the use of chemical agents, such as drugs or medications, to prevent or reduce the occurrence and spread of diseases in animals. These agents can be administered to individuals or groups of animals to provide protection against specific pathogens. Here are some key aspects of chemoprophylaxis in animal disease control:
    - **Antimicrobial Prophylaxis**: Antibiotics may be used as prophylactic agents to prevent bacterial infections in animals. They are commonly employed in situations where there is a high risk of infection, such as during surgery, in the presence of open wounds, or in the face of known disease outbreaks.
    - **Antiparasitic Prophylaxis**: Parasitic diseases are a significant concern in animal health. Antiparasitic drugs, including anthelmintics and ectoparasiticides, can be used as prophylactic measures to prevent infestations and reduce the impact of parasitic diseases. Prophylactic treatment may be administered based on factors such as the animal species, geographic location, seasonality, and specific parasite risks.
    - **Vaccination**: While vaccines are primarily considered a preventive measure, they can also be seen as a form of chemoprophylaxis. Vaccines contain antigens that

stimulate the immune system and provide protection against specific diseases. By vaccinating animals, their immune systems are primed to recognize and respond to pathogens, preventing or reducing the severity of the disease. Vaccination programs are developed based on disease risks, epidemiological considerations, and the availability of effective vaccines.

- **Antiviral Prophylaxis**: In certain cases, antiviral drugs may be used as prophylactic agents against specific viral diseases. These drugs can target viral replication or inhibit viral entry into host cells, reducing the risk of infection or limiting the severity of the disease. Antiviral prophylaxis is often implemented in high-risk situations or for specific animal populations, such as in the control of certain zoonotic diseases or in breeding programs.
- **Residue Management:** When using chemo prophylactic agents, it is essential to consider withdrawal periods to ensure that any residues of drugs are eliminated from animal tissues before they enter the food chain. Proper residue management involves adhering to regulations and guidelines regarding drug use, withdrawal periods, and monitoring programs to ensure consumer safety and prevent the development of antimicrobial resistance.

✓ **Management of pastures**

- Mixed, alternate, sequential, and rotational grazing are different methods of managing grazing animals on pasture or rangeland.
- These approaches involve strategically moving animals between different grazing areas to optimize forage utilization, pasture productivity, and animal health.
- Here's an overview of each grazing method:
  - **Mixed Grazing:** Mixed grazing involves the simultaneous grazing of different livestock species, such as cattle, sheep, and goats, together in the same pasture. Each species has its own grazing preferences and behaviors, which can result in more efficient forage utilization. For example, cattle tend to consume taller grasses while sheep prefer shorter grasses. Mixed grazing can also help control certain types of weeds and pests, as different animal species have varied grazing habits.

» **Alternate Grazing:** Alternate grazing, also known as strip grazing or strip stocking, involves dividing a pasture into smaller sections called paddocks. Animals are confined to one paddock at a time and moved to a new paddock after a specified period. This method allows forage in previously grazed areas to recover before animals return. It promotes more uniform grazing pressure, improves forage regrowth, and helps prevent overgrazing and soil degradation.

» **Sequential Grazing:** Sequential grazing involves moving animals through a series of pastures in a specific sequence. Animals graze one pasture before moving to the next, and the sequence is repeated. The timing and duration of grazing in each pasture can be adjusted based on factors such as forage growth, plant maturity, and soil health. Sequential grazing allows for better forage utilization, encourages plant diversity, and provides rest periods for pastures to recover.

» **Rotational Grazing:** Rotational grazing divides a pasture into multiple paddocks and rotates animals systematically among them. The timing and duration of grazing in each paddock are carefully managed to optimize forage utilization and allow for rest and regrowth. Rotational grazing can help maintain a more even distribution of grazing pressure, enhance forage quality and quantity, improve soil health, and reduce parasite loads by interrupting the life cycle of parasites.

B. Environmental Management: Proper sanitation and hygiene practices, such as regular cleaning of animal living areas and removal of feces, can minimize parasite contamination.

C. Veterinary Guidance:

- Animal deworming strategies should be developed in consultation with a veterinarian who can assess the specific needs of the animal population and the local parasite prevalence.
- The veterinarian will recommend appropriate deworming medications and treatment protocols.

D. Scheduled Treatment:

- Depending on the type of animals (livestock, pets, etc.) and their risk of exposure to parasites, regular deworming treatment schedules are established.
- This may involve treating animals at specific intervals (monthly, quarterly, etc.) or based on seasonal factors.

Self-Check 3	Written test

Name_____ ID _____Signature_____ Date_____

Directions: Answer all the questions below according to the instruction

Part I: Write "True" if the statement is correct or "False" if the statement is incorrect (5 Points)

1. Vaccination is one of the most effective preventive measures against infectious diseases in animals.
2. Implementing biosecurity measures, such as isolation and quarantine, can help prevent the spread of contagious diseases among animals.
3. Antibiotics are commonly used as a preventive measure for viral diseases in animals.
4. Prophylactic measures for parasitic diseases often involve the use of antiparasitic agents, such as de-wormers for internal parasites and acaricides for external parasites like ticks and fleas.
5. Regular surveillance of animal populations is crucial for early detection and control of diseases.

Part II: choice the correct answer from the given alternative (1 pt. each)

1. Which of the following is an important consideration when developing an animal deworming strategy?
   A. Local weather conditions
   B. Animal's breed
   C. Owner's preference
   D. Animal's age
2. What is the purpose of implementing rotational grazing in livestock farming as a deworming strategy?
   A. To prevent overgrazing of pastures
   B. To reduce parasite burdens
   C. To improve animal productivity
   D. To control weed growth
3. Which of the following practices can help minimize parasite contamination in animal living areas?
   A. Providing clean water sources
   B. Implementing biosecurity measures
   C. Regular cleaning of animal living areas

D. Administering vaccines

4. How often deworming treatments should be administered to animals?
   A. Once a year
   B. Every 6 months
   C. Monthly
   D. It depends on the animal species and risk of exposure to parasites
5. Which of the following factors should be considered when determining the appropriate deworming medication for an animal?
   A. Animal's weight
   B. Animal's color
   C. Animal's diet
   D. Animal's gender

Note: Satisfactory rating -5 points, Unsatisfactory 5 below

LG #24 LO #4-Design and implement vaccination

program

Instruction sheet 4

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

- Biology of immune system and types of immunity
- Types of vaccine and importance of vaccination
- General principles and precautions of vaccination
- Design vaccination strategy and booster
- Identify and use common bacterial and viral vaccines

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:

- Introduce biology of immune system and types of immunity.
- Explain importance of vaccination and common types of vaccine.
- Explain and understood general principles and precautions of vaccination in animal.
- Design vaccination strategy considering virulence of the causative agent, spreading velocity of the diseases and geographic distribution host animal.
- Identify and use common and available bacterial vaccines used for different species of animals following manufacturer's instruction.
- Identify and use common and available viral vaccines used for different species of animals following manufacturer's instruction.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks

Information sheet 4

4.1 Biology of immune system and types of immunity

- The immune system is a complex network of cells, tissues, and organs that work together to protect the body from pathogens (such as bacteria, viruses, fungi, and parasites) and other foreign substances, as well as to recognize and eliminate abnormal cells (such as cancer cells).

4.1.1. Biology of immune system

- The immune system is a complex biological system that protects the body from pathogens, foreign substances, and abnormal cells.
- It is composed of various cells, tissues, organs, and molecules that work together to mount immune responses.
- The biology of the immune system is a dynamic and intricate network of interactions that ensure the body's defense against pathogens, while maintaining tolerance to self-antigens.
- It involves the coordinated actions of various cell types, tissues, organs, and molecules to provide effective immune responses.
- Here is a breakdown of the biology of the immune system:

E. Cells of the Immune System:

- White Blood Cells: White blood cells, also known as leukocytes, are key players in the immune system. They are produced in the bone marrow and circulate throughout the body via the bloodstream. White blood cells include phagocytes (neutrophils, macrophages) that engulf and destroy pathogens, and lymphocytes (B cells, T cells, natural killer cells) that carry out specific immune functions.

F. Lymphoid Tissues and Organs:

- Bone Marrow: The bone marrow is the soft, spongy tissue found inside bones and is the site of blood cell production, including immune cells. It produces stem cells that give rise to all types of blood cells, including lymphocytes.

  - ✓ Thymus: The thymus is a gland located in the upper chest. It is crucial for the maturation and education of T cells, a type of lymphocyte. T cells that recognize "self" antigens are eliminated or suppressed to prevent autoimmune reactions.
  - ✓ Lymph Nodes: Lymph nodes are small, bean-shaped structures distributed throughout the body. They are interconnected by a network of lymphatic vessels. Lymph nodes filter lymph fluid, which contains immune cells and other substances, and facilitate interactions between immune cells to mount an immune response.
  - ✓ Spleen: The spleen is a large organ located in the upper left abdomen. It filters the blood, removing old or damaged red blood cells and pathogens. It also serves as a reservoir for immune cells and is involved in immune responses against blood-borne pathogens.
  - ✓ Mucosa-Associated Lymphoid Tissue (MALT): MALT includes lymphoid tissue found in mucosal surfaces, such as the respiratory tract, gastrointestinal tract, and genitourinary tract. MALT provides local immune defense against pathogens that enter the body through these surfaces.

G. Molecules and Mediators:

- Antibodies: Antibodies, or immunoglobulins, are proteins produced by B cells in response to specific antigens. They bind to pathogens, marking them for destruction or neutralization by other components of the immune system.
- Complement System: The complement system is a group of proteins that can be activated by the presence of pathogens or antibodies. It enhances the immune response by facilitating pathogen destruction, promoting inflammation, and assisting in the clearance of cellular debris.
- Cytokines: Cytokines are small signaling molecules secreted by various immune cells. They mediate communication between immune cells and regulate immune responses.

Cytokines can stimulate inflammation, promote cell growth and differentiation, and modulate the activity of immune cells.

- Major Histocompatibility Complex (MHC): MHC molecules are cell surface proteins that play a crucial role in presenting antigens to T cells. They bind to antigen fragments and display them on the cell surface, enabling T cells to recognize and respond to specific antigens.

H. Immune Response:

- Innate Immune Response: The innate immune response is the first line of defense against pathogens. It provides immediate, nonspecific protection. It involves physical barriers (skin, mucous membranes), phagocytic cells (neutrophils, macrophages), natural killer cells, and inflammatory responses.
- Adaptive Immune Response: The adaptive immune response is a highly specific response that develops over time. It involves the activation of B cells and T cells that recognize and target specific antigens. B cells produce antibodies, while T cells can directly kill infected cells or coordinate immune responses.
- Immunological Memory: Following an immune response, memory cells are generated. These cells "remember" the specific pathogens or antigens encountered, allowing for a faster and more robust response upon subsequent exposures, providing long-term immunity.

4.1.1. Types of Immunity

- There are several types of immunity that contribute to the body's defense against pathogens and foreign substances.
- These include innate immunity, adaptive immunity

A. Innate Immunity: known as natural or native immunity

- It is the first line of defense against pathogens and is present from birth.
- It provides immediate, nonspecific protection.
- Innate immune mechanisms include physical barriers (e.g., skin, mucous membranes), chemical barriers (e.g., antimicrobial peptides, enzymes), phagocytic cells (e.g., neutrophils, macrophages), natural killer (NK) cells, and the complement system.

Components or mechanisms innate immunity

I. Physical Barriers:

- Skin: The outermost layer of the skin acts as a physical barrier that prevents the entry of pathogens.
- Mucous Membranes: Mucous membranes lining the respiratory, gastrointestinal, and genitourinary tracts secrete mucus that traps pathogens and contains antimicrobial substances.

II. Chemical Barriers:

- Antimicrobial Peptides: Small proteins with antimicrobial properties, such as defensins and cathelicidins, are present in various body fluids and tissues.
- They directly kill or inhibit the growth of pathogens.
- Enzymes: Enzymes like lysozyme found in tears, saliva, and other secretions can break down the cell walls of bacteria.

III. Cellular Components:

- Phagocytes: Phagocytic cells, including neutrophils and macrophages, engulf and destroy pathogens through a process called phagocytosis.
- They also release antimicrobial substances and present antigens to activate the adaptive immune response.
- Natural Killer (NK) Cells: NK cells are lymphocytes that recognize and destroy infected or cancerous cells. They play a role in detecting and eliminating abnormal cells.

IV. Inflammatory Response:

- Inflammation is a localized response to tissue damage or infection.
- It involves the release of chemical mediators, such as cytokines and histamines, which increase blood flow, enhance vascular permeability, recruit immune cells, and promote tissue repair.

V. Complement System:

- The complement system is a group of proteins that work together to enhance the immune response.

- It can directly kill pathogens, opsonize them for phagocytosis, and trigger inflammatory responses.

B. Adaptive Immunity:

- A specific immune response that develops following exposure to a pathogen or antigen.
- It is characterized by the recognition of specific antigens and the generation of memory cells for long-term protection.
- Involves two main components:

I. Humoral Immunity:

- Mediated by B cells, also known as B lymphocytes.
- B cells recognize antigens and differentiate into plasma cells, which produce and secrete antibodies (also called immunoglobulins) specific to the encountered antigen.
- Antibodies can neutralize pathogens, promote their elimination through phagocytosis, enhance complement activation, or facilitate other immune responses.
- Particularly effective against extracellular pathogens such as bacteria and viruses in the bloodstream or body fluids.

II. Cell-Mediated Immunity:

- Mediated by T cells, also known as T lymphocytes.
- T cells recognize antigens presented on the surface of infected cells or antigen-presenting cells (APCs) via the major histocompatibility complex (MHC) molecules.
- There are two main types of T cells involved in cell-mediated immunity:
- Cytotoxic T cells (also called CD8+ T cells) directly kill infected or abnormal cells.
- Helper T cells (also called CD4+ T cells) secrete cytokines and help coordinate immune responses, activating other immune cells and enabling antibody production by B cells.

- Particularly effective against intracellular pathogens such as viruses, certain bacteria, and parasites.

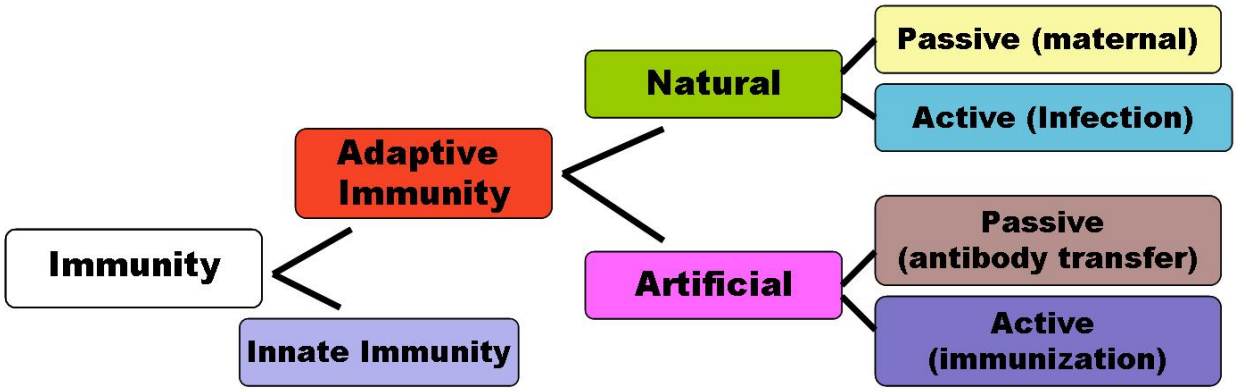


Figure 4.1: Immune system scheme representation

4.2.Types of vaccine and importance of vaccination

- Vaccines are a critical tool in preventing and controlling the spread of infectious diseases. They stimulate the immune system to recognize and fight off specific pathogens, such as viruses or bacteria.

4.2.1. Types of vaccine

- There are several types of vaccines, each designed to target different diseases and employ various mechanisms to provide immunity.
- Here are some common types of vaccines:

I. Inactivated vaccines:

- These vaccines contain pathogens that have been killed, typically through heat or chemicals without altering the immunogenicity of the protective protein.
- It can't replicate in the host) without altering the immunogenicity of the protective protein(s).
- They induce predominantly humoral type of immunity, i.e. antibody-mediated.

- Generally they require two doses with an appropriate interval.
- These vaccines contain adjuvants that enhance the immune reaction.
- Booster doses of inactivated vaccines are often administered annually e.g. black leg, pasteurellosis.

II. Live attenuated vaccines:

- This type of vaccine could be prepared either by using less virulent or by attenuating highly virulent strain/type of an infectious organism.
- Attenuation is usually made by growing of an infectious organism under abnormal culture condition.
- These types of vaccines induce complete type of immune response (both humoral and cellular) and confer higher level and longer period of protection than killed vaccines.
- Live vaccine especially attenuated ones may revert to full virulence after inoculation into an animal and elicit disease
- E.g. PPR, Rinder pest, lumpy skin disease
- They often confer long-lasting immunity but may not be suitable for individuals with weakened immune systems.

II. Toxoid vaccines

- A type of vaccine that provide protection against diseases caused by bacterial toxins.
- These vaccines are made from inactivated toxins that have been treated to remove their harmful effects while still maintaining their ability to stimulate an immune response.
- Here are a few examples of toxoid vaccines: Diphtheria Toxoid Vaccine, Tetanus Toxoid Vaccine:

III. Autogenous vaccines, also known as autogenous or autologous bacterins:

- A type of vaccine that is specifically formulated and produced for individual animals or a particular group of animals within a specific geographic area.

- These vaccines are created using bacterial or viral strains isolated from the affected animals themselves or the local environment.
- Autogenous vaccines are typically used in situations where commercial vaccines are not available or are not effective against a specific strain of the pathogen.
- Autogenous vaccines can be developed by isolating and culturing bacterial strains from affected animals, and then formulating a vaccine specifically tailored to the bacterial strains prevalent in a particular herd or geographical area.
- Examples of autogenous vaccines: Bovine Respiratory Disease (BRD) Vaccine, Avian Influenza (AI) Vaccine, Swine Respiratory Disease Vaccine: Swine respiratory diseases, such as porcine respiratory coronavirus (PRCV).

IV. Serovaccine

- It is a combination of antisera with a vaccine to produce passive and active immunity e.g. rabies.
- These vaccines are generally safe and can be used for individuals with weakened immune systems.

V. Recombinant Vaccines

- A type of vaccine that utilizes genetic engineering techniques to produce antigens that can stimulate an immune response in the body.
- In veterinary medicine, recombinant vaccines have been developed and used to protect animals against various diseases.
- These vaccines are typically produced by inserting genes encoding specific antigens into a vector, such as a virus or a bacterium, which can then deliver the antigen into the animal's cells.
- The animal's immune system recognizes the antigen as foreign and mounts an immune response, generating immunity against the target pathogen.
- Recombinant vaccines have been successfully used in animals to protect against diseases such as:

- Livestock diseases: Such as cattle, pigs, and poultry, to protect them against diseases like foot-and-mouth disease, swine fever, avian influenza, and Newcastle disease.
- Aquaculture diseases: Examples include vaccines against infectious salmon anemia virus, infectious pancreatic necrosis virus, and bacterial pathogens like Aeromonas salmonicida.
- Companion animal diseases: These vaccines target diseases like canine parvovirus, feline leukemia virus, equine influenza, and others.
- Recombinant vaccines offer several advantages in animal vaccination, including better safety profiles, precise antigen design, and the potential for multivalent vaccines that can protect against multiple diseases simultaneously.
- Their use in animals can face challenges related to cost, regulatory approvals, and the specific requirements of different animal species.

4.2.2. Importance of vaccination

✓ Vaccination plays a vital role in protecting the health and well-being of animals. Here are some key reasons why vaccination is important in animals:

✓ Disease prevention: By vaccinating animals, we can reduce the incidence and severity of diseases that can be detrimental to their health.

✓ Control of contagious diseases: Vaccination helps create a barrier of immunity within the population, reducing the likelihood of outbreaks and limiting the transmission of diseases.

✓ Zoonotic disease prevention: By vaccinating animals against zoonotic diseases, we not only protect the animals themselves but also reduce the risk of transmission to humans.

✓ Animal welfare: It helps prevent animals from suffering from preventable diseases that can cause pain, discomfort, and even death.

✓ Disease eradication: Vaccination has been instrumental in eradicating or significantly reducing the prevalence of certain animal diseases. For example, widespread vaccination campaigns have successfully eliminated diseases like rinderpest in cattle and canine distemper in wild carnivores.

✓ Economic impact: Vaccination reduces the need for costly treatments, decreases production losses, and ensures the continuity of animal-based products.

4.3. General principles and precautions of vaccination

4.3.1. General principles of vaccination in animals:

- Consultation with a Veterinarian:
- Vaccination Schedule:
  - ✓ Follow a recommended vaccination schedule that outlines the timing and frequency of vaccinations for each animal species.
  - ✓ The schedule may vary based on factors such as maternal antibody interference, disease prevalence, and local regulations.
- Vaccination Coverage:
  - ✓ Aim for widespread vaccination coverage within the herd or flock to maximize the benefits of vaccination.
  - ✓ Vaccinating a large percentage of animals helps to build herd or flock immunity and reduce the overall disease burden.
- Vaccine Selection:
  - ✓ Choose vaccines that are proven to be safe and effective against the target pathogens. Vaccines should be licensed or approved by regulatory authorities and obtained from reputable manufacturers or distributors.
- Proper Vaccine Storage:
  - ✓ Vaccines should be stored and handled according to the manufacturer's instructions.
  - ✓ Follow specific temperature requirements to ensure the vaccines remain viable. Improper storage can compromise vaccine efficacy.
- Administration Techniques:
  - ✓ Administer vaccines using proper techniques and adhere to the recommended route of administration (e.g., subcutaneous, intramuscular, intranasal).
  - ✓ Use sterile needles and syringes for each animal to prevent contamination and the spread of disease.
- Record Keeping:
  - ✓ Maintain accurate and up-to-date vaccination records for each animal.

- ✓ Record the vaccine name, batch number, administration date, and any adverse reactions or booster requirements.
- ✓ This information is valuable for tracking vaccination history and disease management.

- Monitoring for Adverse Reactions:
  - ✓ Observe animals for any adverse reactions following vaccination.
  - ✓ Common reactions may include mild swelling at the injection site or temporary fever. Severe or persistent reactions should be reported to a veterinarian for evaluation.
- Revaccination and Booster Shots:
  - ✓ Follow the recommended revaccination or booster shot schedules to ensure continued immunity.
  - ✓ Some vaccines require multiple doses or periodic boosters to maintain protection against the target pathogens.
- Biosecurity Measures:
  - ✓ Implement biosecurity protocols to minimize disease transmission during vaccination.
  - ✓ This includes disinfecting equipment, maintaining clean vaccination areas, and preventing contact between vaccinated and unvaccinated animals. Sick animals shouldn't be vaccinated

4.3.2. Precautions of vaccination

- Animals should not be vaccinated within three to four weeks after taking drugs.
- Don't administer antibiotics when a vaccine containing live bacteria is administered.
- Stressing of animals to be vaccinated should be avoided.
- Repeated use of needles and syringes within herd/flock is undesirable.
- Injectable vaccines should be stored and reconstituted as recommended by the manufacturer.
- Liquid preparations should always be adequately shaken before use.
- Accidental self-injection with oil-based vaccines requires medical attention has to be taken.

- Quarantine and Biosecurity Measures: Implement appropriate biosecurity measures, such as disinfection of equipment and minimizing contact between vaccinated and unvaccinated animals.
- Record Keeping: Maintain accurate and up-to-date vaccination records for each animal, including the vaccine name, batch number, administration date, and any adverse reactions. This information is valuable for tracking vaccination history and disease management.
- Compliance with Regulations: Adhere to local, regional, and national regulations regarding vaccination requirements and certifications for specific diseases. Stay informed about any changes or updates in vaccination regulation
- Allergies and Sensitivities: Be aware of any known allergies or sensitivities that animals may have to vaccine components. If an animal has experienced adverse reactions in the past, consult with a veterinarian to determine if alternative vaccines or precautions are necessary.
- Observation for Adverse Reactions: Monitor animals closely after vaccination for any adverse reactions. Common reactions may include mild swelling at the injection site, temporary fever, or lethargy.
- Vaccine Quality and Handling: Use vaccines that are approved and purchased from reputable sources. Ensure that vaccines are stored and handled according to the manufacturer's instructions to maintain their efficacy. Improper storage or handling can reduce vaccine effectiveness.
- Individual Animal Considerations: Take into account the individual animal's health status, age, and any pre-existing conditions before administering vaccines. Some animals may have specific contraindications or require modified vaccination protocols.
- Timing and Intervals: Follow the recommended timing and intervals between vaccinations to ensure optimal immune response. Administering vaccines too close together or delaying vaccinations can impact their effectiveness.
- Proper Administration Technique: Administer vaccines using appropriate techniques and adhere to the recommended route of administration (e.g., subcutaneous, intramuscular).

Use sterile needles and syringes for each animal to prevent contamination and the spread of infections.

4.4. Design vaccination strategy and booster

- Developing a vaccination strategy for animals involves considering various factors, such as the target species, regional disease risks, animal population characteristics, and available vaccines.
- Key steps to consider when developing a vaccination strategy for animals:
  - ✓ **Identify Target Diseases:**
    - Determine the prevalent diseases that pose a significant risk to the target animal population.
    - Consider both infectious diseases and those with high economic impact.
  - ✓ **Assess Disease Risk Factors:**
    - Evaluate the factors that contribute to disease transmission and susceptibility within the animal population.
    - This includes factors such as age, production system, management practices, and exposure risks.
  - ✓ **Consult with a Veterinarian:**
    - Seek guidance from a veterinarian who has expertise in the target animal species and regional disease patterns.
    - They can help tailor the vaccination strategy based on specific needs and risks.
  - ✓ **Select Appropriate Vaccines:**
    - Research and select vaccines those are effective against the target diseases.
    - Consider factors such as vaccine efficacy, safety, duration of immunity, and compatibility with other vaccines or management practices.
  - ✓ **Determine Vaccination Schedule:**
    - Establish a vaccination schedule that outlines the timing and frequency of vaccinations.
    - Consider factors such as the age of animals, maternal antibody interference, and the optimal timing for vaccine administration to achieve maximum protection.

- ✓ **Consider Herd or Flock Immunity:**
  - Develop a strategy to ensure widespread vaccination coverage within the animal population.
  - Aim to vaccinate a significant proportion of the population to achieve herd or flock immunity and reduce overall disease prevalence.
- ✓ **Vaccination Protocols:**
  - Determine the appropriate route of administration (e.g., subcutaneous, intramuscular) and dosage for each vaccine.
  - Follow proper administration techniques to ensure accurate delivery and minimize the risk of adverse reactions.
- ✓ **Record Keeping:**
  - Maintain accurate and up-to-date vaccination records for individual animals or groups.
  - Record the vaccine name, batch number, administration date, and any adverse reactions. This helps track vaccination history and aids in disease management.
- ✓ **Monitor Vaccine Efficacy:**
  - Assess the effectiveness of the vaccination strategy by monitoring disease incidence and vaccine response in the animal population.
  - Regularly review and update the vaccination strategy based on surveillance data and emerging disease threats.
- ✓ **Education and Communication:**
  - Educate animal owners, caretakers, and stakeholders about the importance of vaccination and the implemented strategy.
  - Foster communication channels to address concerns, provide updates, and promote compliance with the vaccination program.

- Remember that a vaccination strategy should be periodically reviewed and updated based on changes in disease prevalence, newly available vaccines, and advancements in veterinary science.

4.4.1. Vaccination strategy components

- It is a comprehensive plan that outlines the approach and guidelines for administering vaccines to individuals or populations to prevent the spread and impact of infectious diseases.
- The strategy is developed based on factors such as the target population, disease profile, vaccine availability, and public health goals.
- Key components of a vaccination strategy
  - ✓ Disease Prioritization:
    - Identify and prioritize the diseases that pose significant health risks to the target population.
    - Consider factors such as disease prevalence, severity, transmission routes, and potential for outbreaks.
  - ✓ Vaccine Selection:
    - Determine the appropriate vaccines that provide protection against the target diseases.
    - Consider factors such as vaccine efficacy, safety, availability, cost-effectiveness, and recommendations from regulatory bodies or advisory committees.
  - ✓ Target Population:
    - Define the specific population or group that will be the focus of the vaccination strategy.
    - This may include specific age groups, high-risk individuals, healthcare workers, or the general population.
  - ✓ Vaccination Schedule:
    - Establish a schedule for vaccine administration, including the recommended age or time intervals for each dose.
    - Consider factors such as the optimal timing for vaccination, the number of doses required for primary and booster immunizations, and any specific considerations for different vaccine types.
  - ✓ Vaccine Delivery:
    - Determine the delivery methods and settings for vaccine administration.

- This may include vaccination through healthcare facilities, outreach programs, mass vaccination campaigns, or schools, depending on the target population and available resources.

✓ Vaccine Supply and Logistics:

- Ensure an adequate and reliable supply of vaccines by establishing procurement mechanisms, storage facilities, and distribution networks.
- Consider cold chain requirements, stock management, and contingency plans to address potential shortages or emergencies.

✓ Vaccine Safety Monitoring:

- Implement systems for monitoring and reporting adverse events following vaccination (AEFIs).
- Establish mechanisms to track and investigate any reported side effects, ensuring public confidence in the vaccination program.

✓ Communication and Education:

- Develop communication strategies to raise awareness about the importance of vaccination, address vaccine hesitancy, and provide accurate information about vaccine safety and efficacy.

✓ Surveillance and Evaluation:

- Establish systems for surveillance to monitor disease incidence, vaccine coverage, and vaccine effectiveness.
- Regularly evaluate the impact of the vaccination strategy, identify areas for improvement, and make adjustments based on emerging evidence or changing epidemiological patterns.

✓ Collaboration and Coordination:

- Foster collaboration among relevant stakeholders, including healthcare providers, public health authorities, community leaders, and international partners.

4.4.2. Vaccination Strategies employed to disease prevention and control

- Several strategies are employed to ensure effective disease prevention and control.

- These strategies may vary depending on the target species, disease risks, and management practices.
- Common strategies for vaccine use in animals:
  - ✓ **Ring vaccination**
    - A strategy used in the control and eradication of infectious diseases, particularly those caused by highly contagious pathogens.
    - It involves vaccinating individuals in a defined "ring" around an identified case of infection to create a buffer zone of immunity and prevent the spread of the disease.
    - It is particularly effective in situations where the disease has a high transmission rate and where resources for mass vaccination may be limited or impractical.
    - It aims to create a buffer of immune individuals around the infected case, preventing further spread of the disease and eventually leading to its containment and elimination.
    - The process of ring vaccination typically involves the following steps:
      - » **Identification of a confirmed case:** When a case of infection is identified, such as a case of a highly contagious disease like Ebola, smallpox, or a new emerging infectious disease, it serves as the starting point for ring vaccination.
      - » **Contact tracing and surveillance**: Health authorities conduct thorough contact tracing to identify individuals who have come into close contact with the confirmed case. This involves identifying and monitoring individuals who may be at higher risk of contracting and spreading the disease.
      - » **Ring formation**: Based on the contact tracing and surveillance, a ring is created around the confirmed case. The ring includes individuals who have had direct contact with the case and those who are at higher risk of infection due to their proximity. The size and configuration of the ring can vary depending on the specific disease and its transmission dynamics.

- » **Vaccination of the ring**: Vaccination is then carried out within the identified ring. The individuals within the ring are vaccinated, regardless of their infection status, to provide immediate protection against the disease. Typically, a highly effective and safe vaccine is used for this purpose.
- » **Monitoring and follow-up**: Following the vaccination, close monitoring and follow-up of the vaccinated individuals are conducted to track any potential cases, assess the effectiveness of the vaccination campaign, and identify any adverse effects.

✓ **Barrier vaccination**, also known as "fence-line" vaccination

- A strategy used in animal disease control to create a buffer zone of vaccinated animals as a barrier against the spread of infectious diseases.
- It involves vaccinating animals in a specific geographic area surrounding an outbreak to prevent the further spread of the disease to neighboring populations.
- The specific application and effectiveness of barrier vaccination can vary depending on the characteristics of the infectious disease, the availability of vaccines, the logistics of vaccination campaigns, and the cooperation of farmers and stakeholders in implementing control measures.
- By vaccinating animals in close proximity to the outbreak, the spread of the disease can be contained and prevented from reaching new areas.
- Commonly used in livestock farming, particularly for diseases that have the potential to rapidly spread among animals, such as foot-and-mouth disease (FMD), avian influenza, and contagious bovine pleuropneumonia.
- Implemented in conjunction with other disease control measures, such as movement restrictions, biosecurity protocols, and surveillance, to effectively manage and control the disease outbreak.
- The process of barrier vaccination typically involves the following steps:
  - » **Identification of the outbreak**: When an outbreak of an infectious disease is detected in a specific area, such as a farm or a region, it serves as the focal point for barrier vaccination.

- **Determination of the buffer zone**: Based on the characteristics of the disease and its mode of transmission, the appropriate radius for the buffer zone is determined. This radius is typically established around the outbreak site, encompassing neighboring farms or susceptible populations.
- **Vaccination of animals in the buffer zone**: Vaccination is carried out within the buffer zone, targeting animals at risk of contracting and spreading the disease. The specific vaccination protocol may vary depending on the disease and the available vaccines. Typically, a vaccine with a high efficacy and appropriate coverage against the target pathogen is used.
- **Monitoring and surveillance**: Following vaccination, close monitoring and active surveillance of the vaccinated animals and neighboring populations are conducted to detect any potential cases and assess the effectiveness of the barrier vaccination. This may involve regular testing, observation of clinical signs, and reporting of any new suspected cases.

✓ **Suppressive or dampening-down vaccination**

- A vaccination strategy used in animals to reduce the severity of disease symptoms and limit the spread of infections, particularly in the case of certain chronic or persistent diseases.
- It involves administering vaccines to already infected animals to suppress the replication and shedding of the pathogen, ultimately reducing the impact of the disease.
- Aims to reduce the viral load or bacterial burden in infected animals, leading to a decrease in the severity of clinical signs and a decrease in the transmission of the pathogen to other susceptible animals.
- It can be particularly useful in managing diseases with persistent infections or chronic carrier states, where complete eradication may be difficult to achieve.

- Example: use of MLV vaccines for bovine viral diarrhea virus (BVDV) in cattle. BVDV has both acute and persistent forms and suppressive vaccination with MLV vaccines has been employed to reduce the impact of persistent infections and prevent the spread of the virus within herds.
- It is not applicable to all diseases and should be used in accordance with veterinary advice and specific disease management protocols.
- The availability and suitability of suppressive vaccines may vary depending on the target pathogen and the particular animal species involved
- The process of suppressive vaccination in animals typically involves the following steps:
  - **Identification of infected animals:** Animals that have already been infected with the target pathogen are identified through diagnostic testing or clinical signs. These animals serve as the target population for suppressive vaccination.
  - **Selection of appropriate vaccines:** Vaccines are selected based on the specific disease and the available options. In some cases, modified live vaccines (MLVs) or vectored vaccines may be used, as they can replicate within the host and induce a prolonged immune response.
  - **Administration of vaccines to infected animals**: The selected vaccines are administered to the infected animals. The timing and dosage of the vaccines may vary depending on the disease and the specific vaccine used. The goal is to stimulate an immune response that can control or suppress the replication of the pathogen.
  - **Monitoring and surveillance:** Close monitoring and surveillance of the vaccinated animals are carried out to assess the effectiveness of the suppressive vaccination. This may involve periodic testing to check for pathogen shedding, clinical observation, and evaluation of disease progression.

✓ **Mass vaccination**

- Large-scale administration of vaccines to a significant proportion of an animal population with the goal of achieving widespread immunity and controlling or eradicating a specific infectious disease.
- It is a common strategy employed in veterinary medicine to prevent the spread of diseases and protect animal health and welfare.
- It is organized and implemented by veterinary authorities, government agencies, or international organizations to address disease outbreaks or prevent the emergence and spread of certain pathogens.
- Mass vaccination in animals has been instrumental in controlling and eliminating diseases such as foot-and-mouth disease, rabies, Newcastle disease, and brucellosis in various animal species worldwide.
- It's worth noting that the specific implementation and strategies for mass vaccination can vary depending on the targeted disease, regional epidemiology, animal species, and local regulations and guidelines.
- Key aspects and considerations related to mass vaccination in animals:
  - **Disease control and eradication**: It plays a crucial role in controlling and eradicating infectious diseases in animal populations. By vaccinating a large number of animals, it aims to interrupt the transmission cycle of the pathogen, reduce disease prevalence, and ultimately eliminate the disease from the population.
  - **Vaccine selection:** The selection of vaccines for mass vaccination campaigns depends on the targeted disease, the characteristics of the pathogen, and the availability of safe and effective vaccines. Vaccines may be composed of inactivated pathogens, live attenuated strains, subunit antigens, or recombinant proteins, among other formulations.
  - **Vaccine coverage:** Achieving high vaccine coverage is essential for the success of mass vaccination campaigns. Vaccinating a significant proportion of the target population is necessary to establish herd immunity,

where a sufficient number of animals are immune, reducing the risk of transmission and protecting susceptible individuals.

- **Logistics and infrastructure:** Mass vaccination campaigns require adequate planning, logistics, and infrastructure to ensure the efficient and timely delivery of vaccines to the target population. This includes vaccine procurement, cold chain management, trained personnel, and appropriate facilities for vaccine administration.
- **Monitoring and surveillance:** Effective monitoring and surveillance systems are vital to assess the impact and effectiveness of mass vaccination programs. This involves monitoring vaccine coverage, evaluating disease incidence, conducting post-vaccination serological surveys, and promptly detecting and responding to any adverse events or vaccine failures.
- **Collaboration and communication:** Successful mass vaccination campaigns rely on collaboration and coordination between veterinary authorities, animal health professionals, livestock owners, and other stakeholders. Clear communication and education programs are important to promote vaccine acceptance, inform the public, and address concerns or misconceptions related to vaccination.

✓ **Blanket vaccination**

- It is the practice of vaccinating an entire population or group of animals against a specific disease, regardless of individual risk or disease status.
- It is a proactive approach aimed at providing broad immunity and preventing the spread of infectious diseases.
- It can be a valuable tool in animal health management, particularly for controlling and preventing the spread of infectious diseases.
- However, its application should be carefully evaluated based on disease characteristics, population dynamics, cost-effectiveness, and individual risk assessment to ensure optimal outcomes.
- Key points to consider regarding blanket vaccination in animals:

- **Disease Control:** Blanket vaccination can be an effective strategy for controlling and preventing the spread of contagious diseases within animal populations. By vaccinating all animals, including susceptible and potentially infected individuals, the goal is to establish herd or population immunity, reducing the overall disease burden.
- **Outbreak Management**: In the event of an outbreak, blanket vaccination may be used as an emergency measure to quickly control disease transmission. It can help contain the outbreak, protect susceptible individuals, and minimize the impact on animal welfare, production, and public health.
- **Disease Elimination and Eradication:** Blanket vaccination campaigns have played a crucial role in the successful elimination and eradication of certain diseases in animals. Examples include the eradication of rinderpest in cattle and the elimination of canine parvovirus in dog populations. These achievements were possible through widespread vaccination efforts.
- **Simplified Decision-Making:** Blanket vaccination simplifies the decision-making process by removing the need for individual risk assessment and testing. It eliminates the time and resources required for identifying and targeting specific high-risk animals, especially in large and complex populations.
- **Challenges of Blanket Vaccination:** While blanket vaccination can be advantageous, there are certain challenges to consider. These include the cost of vaccines, logistics of administering vaccines to large populations, potential adverse reactions to vaccination, and the need for proper vaccine storage and handling.
- **Impact on Herd Immunity:** Blanket vaccination contributes to the establishment of herd immunity within a population. Herd immunity occurs when a significant proportion of the population is immune to a disease, reducing the chances of susceptible individuals coming into contact with

infected individuals. This indirectly protects unvaccinated or susceptible animals, such as those too young or too sick to receive vaccines.

» **Disease Variation and Effectiveness:** The effectiveness of blanket vaccination may vary depending on the disease characteristics, vaccine efficacy, and the population's vaccination coverage. Some diseases may require more targeted vaccination strategies due to variations in disease prevalence, transmission dynamics, or the availability of vaccines with different levels of efficacy.

» **Consideration of Individual Risk:** In some cases, blanket vaccination may not be the most appropriate strategy, especially when individual risk assessment is essential. Certain animals, such as those with compromised immune systems or specific health conditions, may require tailored vaccination protocols based on their individual risk factors.

» **Regulatory and Policy Considerations:** The implementation of blanket vaccination programs may be influenced by local regulations, veterinary guidelines, and national or regional policies. It is important to adhere to legal requirements and consult with veterinary authorities or experts when planning and executing vaccination campaigns.

» **Monitoring and Surveillance:** Even with blanket vaccination, ongoing monitoring and surveillance of disease prevalence and vaccine effectiveness are necessary. Regular evaluation helps assess the impact of vaccination programs, identify emerging disease threats, and guide future vaccination strategies.

4.4.3. Vaccination schemes in animals

- The recommended schedules and protocols for administering vaccines to provide optimal protection against specific diseases.
- These schemes can vary depending on factors such as the species of animal, their age, geographical location, disease prevalence, and the specific vaccines available.
- Vaccin for animal can be

- ✓ **Non-core vaccines**: are vaccines that are not considered essential for all animals but may be recommended based on specific risk factors or management practices.
- ✓ **Core vaccines**: Considered essential and recommended for all animals within a certain population or region. These vaccines target diseases that are highly prevalent, have significant economic impact or pose a risk to public health.

✓ Vaccination schemes for common animals:

- Dogs:

  Core Vaccines: Core vaccines for dogs typically include vaccines against canine distemper virus, canine parvovirus, canine adenovirus (hepatitis), and rabies. Puppies usually receive a series of vaccinations starting at 6-8 weeks of age, with booster shots given every 3-4 weeks until they reach 16-20 weeks of age. Booster shots are then administered every 1-3 years, depending on the vaccine and local regulations.

  Non-Core Vaccines: Non-core vaccines for dogs may include vaccines against diseases like canine parainfluenza virus, Bordetella bronchiseptica (kennel cough), and leptospirosis. The vaccination schedule for non-core vaccines may vary depending on the risk factors and the specific needs of the dog.

- Cats:

  Core Vaccines: Core vaccines for cats usually include vaccines against feline herpesvirus, feline calicivirus, feline panleukopenia virus, and rabies. Kittens typically receive a series of vaccinations starting at 6-8 weeks of age, with booster shots given every 3-4 weeks until they reach 16-20 weeks of age. Booster shots for core vaccines are generally administered every 1-3 years.

  Non-Core Vaccines: Non-core vaccines for cats may include vaccines against diseases like feline leukemia virus (FeLV), feline immunodeficiency virus (FIV), and feline infectious peritonitis (FIP). The vaccination schedule for non-core vaccines may vary depending on the risk factors and the specific needs of the cat.

- **Livestock (Cattle, Sheep, and Goats):**

Core vaccine: Clostridial Disease Vaccines, Pasteurellosis Vaccines, Foot-and-Mouth Disease (FMD) Vaccine, Rabies Vaccine.

Non-core vaccine: includes Vibrio Vaccine (Cattle): Campylobacteriosis Vaccine, Chlamydophila abortus Vaccine, Rotavirus Vaccine (Calves and Lambs).

4.5. Identify and use common bacterial and viral vaccines

4.5.1. Common bacterial vaccines

I. Vaccines Used in Ruminants

A. Bovine pasteurellosis vaccine (hemorrhagic septicemia)

Description	Killed vaccine by 0.3% formalin
Presentation	The vaccine is liquid suspension available in vials of 100 ml for 50 doses
Dosage and administration	For best results vaccinate animals at least 21 days before the hemorrhagic septicemia season. Shake the product vigorously before use; inject adult and calves with 2 ml SC.
Immunity	Immunity appears in 10 days after vaccination and lasts for 6 to 8 months. Revaccination is advised after 6 months.
Side-effects	Anaphylactic reactions may appear occasionally after vaccination of Zebus; serious in & very often on some European cattle breeds, particularly on animals, which have been vaccinated many times against foot-and-mouth disease, Blackleg or Anthrax. Thus sensitiveness should be checked in these breeds before use. In case of reaction, immediate injectioin of antihistamine is recommended.
Storage	At room temperature for 6 months; at +4˚C for 1 year; avoid light and heat.

B. Anthrax vaccine

Description	Freeze-dried live bacterial vaccine.
Indication	For prevention or control of anthrax in domestic animals
Presentation	The freeze-dried vaccine is available in 20 ml vials of 100 doses.
Dosage and administration	Reconstitute the product in 100 ml of sterile saline water. Cattle & equines: 1 ml SC in the loose skin of the neck just in front of the shoulder. Sheep & goats: 0.5 ml SC in the loose skin or in the inner face of the thigh. The latter is preferable for goats.
Booster:	Vaccination should be carried out every year before the anthrax season.
Immunity	Develops in 10 days and lasts for one year
Side-effect	Swelling at the injection site. It normally disappears in 2-3 days
Precautions	Inject SC only & animals above 3 months of age. Pregnant animals should not be vaccinated. Antibiotic should not be given shortly before and 14 days after vaccination. Destroy empty bottles or if unstable by incinerations.
Withdrawal period	Meat- for six weeks after vaccination
Storage	Store it in refrigerator at 4˚C.

J. Blackleg vaccine

Description	Killed vaccine by formalin 0.5%.
Indication	Control or prevention of blackleg disease in cattle.
Presentation	It is a liquid suspension vaccine available in 100 ml vials for 50 doses
Dosage and administration	Shake the product vigorously before use and vaccinate cattle including calves; inject 2 ml SC.
Immunity	Immunity develops in 10 days after vaccination
Booster	every year in endemic areas

Storage	At +20˚C for 6 months; at +4˚C for 1 year. Avoid light and heat.

K. Brucellosis

Description of the vaccine	Abortion and infertility in cattle caused by *Brucella abortus* can be very successfully controlled by vaccination. There are two vaccines available in the market, strain 19 (S19) and strain 45/20 (45/20).
Strain 19 vaccine *Description*	S19 is a live vaccine and is presented in freeze-dried form, which is reconstituted with diluent immediately prior to use.
Dosage & administration	The dosage is 5 ml given subcutaneously. Cattle from two months of age are given though calf vaccination is ideal and lasts for seven years. Inoculation of adult cattle is very successful in controlling severe outbreaks of abortion. Bulls shouldn't be vaccinated with S19.
Side-effects	*Vaccination reactions*: localized swellings at the site of injection can occur, especially in adult cattle that are sterile, don't rupture and persist for many months as fibrous nodules. Generalized systemic reactions can also occur with high temperatures and loss of milk in lactating cows. Heavily pregnant cows have been known to abort and shouldn't be vaccinated.
Zoonotic risks	The vaccine is live and accidental injection into cattle handlers and veterinary surgeons can cause severe illness (undulant fever) and so great care must be taken when handling the vaccine.
Strain 45/20 vacc.	Strain 45/20 is a killed vaccine.
Dosage and administration	Two inoculations are given by subcutaneous injection to animals over six months of age. S/E: There are often large

localized reactions at the site of injection.

L. Contagious bovine pleuropneumonia (CBPP) vaccine

Description	It is a freeze-dried live attenuated bacterial vaccine.
Indication	For the control or prevention of contagious bovine pleuropneumonia in cattle
Presentation	The freeze-dried vaccine contains 100 doses per vial.
Dosage and administration	Reconstitute the vaccine in 100 ml of cold and sterile saline water. Inject 1 ml of the reconstituted vaccine subcutaneously only. Vaccinate all animals above 6 months of age
Immunity	It develops 3 weeks post-vaccination
Booster dose	Annually
Side-effect	A rare case of post-vaccinal reaction (mild swelling at the site of injection) can occur. If it occurred, antibiotics like Tetracycline, Oxytetracycline, Erythromycin and Tylosin can be used.
Precautions	The reconstituted vaccine must be protected from light and heat and used immediately (the maximum limit is 1 hour when kept under cold condition).
Storage	At +4˚C for 6 months; at -20˚C for several years.

M. Contagious Caprine Pleuropneumonia (CCPP)

Description	It is an inactivated bacterial vaccine.
Indication	To control or prevent CCPP in goat
Presentation	The vaccine is in liquid suspension, which is available in 100 ml for 100 doses.
Dosage and administration	Shake the vaccine before use and vaccinate 1 ml/goat subcutaneously (thoracic area is advisable).

Immunity	CCPP vaccine confers immunity for 1 year. Revaccination should be made after a year.
Side-effect	Slight edematous reaction is induced by the adjuvant, saponin, which disappears in 48 hours.
Storage	The vaccine should be stored at +4˚C at least for 1 year.

N. Ovine pasteurellosis vaccine

Description	Killed vaccine by 0.3% formalin
Indication	Control or prevention of pasteurellosis in sheep.
Presentation	The vaccine is in liquid suspension form and available in vials of 50 ml for 50 doses.
Dosage and administration	Shake the product vigorously before use; vaccinate 1 ml/sheep SC. For best results vaccinate according to regional conditions, at least 3 weeks before the rainy season.
Immunity	Immunity appears in 10 days after vaccination and lasts for 6 to 8 months.
Storage	At +20˚C for 6 months, at +4˚C for 1 year
Precaution	Avoid light and heat.

O. Neonatal calf diarrhea vaccine

Description	There are vaccines and serovaccines available.
Presentation	The main vaccine available is a white oily emulsion containing inactivated bovine rotavirus and *E.coli* K99 antigens adsorbed on to aluminium hydroxide gel and emulsified in a light mineral oil.
Dosage and administration	Cows and heifers: 1 ml/head IM at the side of the neck, from 12 to 14 weeks before the expected calving date. Calves: must receive adequate colostrums within the first 6 hours of life

	Suckling calves: should receive colostrums and/or milk from vaccinated cows for the duration of the critical period. Bucket fed calves: pool the milk from vaccinated cows obtained from the first six to eight milkings and then fed to calves at a rate of 2.5-3.5 lit/day, according to size, for the first 14 days of life. Vaccinate all cows in a herd to reduce infection and the level of excretion is kept to a minimum.
Contra-indications	Only healthy animals should be vaccinated. Partly used vials of vaccine should be discarded.
Side-effects	Occasionally, there is a reaction at the site of injection. Hypersensitivity reactions may occur.

P. Enzootic pneumonia of calves' vaccine

Description	This type of vaccine is freeze-dried preparation containing live PI_3 virus strain.
Dosage and administration	The vaccine is administered intranasally. The calf is held with its head inclined upwards and the whole 2 ml dose is instilled into one nostril using special applicator. A short time is allowed for the vaccine to flow out into the upper respiratory tract. A single dose only is necessary for calves of 12 weeks of age or older but in young calves two doses should be given at three weeks and ten weeks old. Vaccination can commence at a week old.

Q. Lumpy skin disease vaccine

Description	A bivalent vaccine manufactured from locally isolated from A and O serotypes are produced. Inactivated with 0.3%.
Indication	Control or prevention of Foot and Mouth Disease in cattle.
Dosage and	Shake the bottle before use and inject 4 ml/head of cattle SC,

administration	preferably in dewlap region. The first vaccination requires two injections at 6 months of interval.
Booster	Annually and consider the outbreak season
Immunity	2-3 weeks after vaccination and may last for one year.
Side-effects	Swelling may occur at the site of inoculation and persist for a few weeks.
Precaution	After puncture of the stopper the whole bottle of the vaccine must be used within 24 hours. Don't vaccinate the cattle under 6 months of age. It is better not to associate other vaccination with FMD and not to make another vaccination one month before and after FMD vaccination.
Storage	Store the vaccine at +4˚C.

R. Peste des Petits Ruminants (PPR) vaccine

Description	Lyophilized virus vaccine PPR strain cultured on vero-cells. Freeze-dried vaccine.
Indication	To control or prevent PPR in goat and sheep.
Presentation	20 ml vial of 100 doses of lyophilized vaccine.
Dosage and administration	Inject 1 ml of the diluted vaccine subcutaneously in both sheep and goat.
Precaution	Immunization before 6 months of age should be avoided since parental acquired immunity can interfere with the vaccination.
Immunity	Immunity can develop eight days after vaccination; immunity is lifelong.
Storage	Vaccine should be stored at a temperature of -20˚C

S. Sheep and goat pox vaccine

Description	Lyophilized live freeze-dried vaccine.
Indication	To control or prevent sheep and goat pox.
Presentation	20 ml vials of 100 doses of lyophilized vaccine
Dosage and administration	Reconstitute 20 ml of the product in 100 ml of cool and sterile saline water and inject 1 ml of diluted vaccine subcutaneously on the inner face of the thigh.
Immunity	Eight days after vaccination and lasts for 2 years.
Storage	Vaccine should be stored at a temperature of 20˚C.

II. Vaccines Used in Equines

A. Anthrax vaccine

The vaccine and application is similar to ruminants (*see* Vaccines used in Ruminants: Anthrax).

B. African horse sickness vaccine

Description	Lyophilized virus vaccine containing neurotropic type 9-strain.
Indication	To control or prevent African horse sickness.
Presentation	20 ml vials of 20 doses of lyophilized vaccine.
Dosage and administration	Reconstitute the product in 20 ml of cool and sterile saline water and inject 1 ml of diluted vaccine subcutaneously for horses, donkeys and mules regardless of body size and age.
Immunity	Appears one month after vaccination and may last for one year.
Storage	Vaccine should be stored at a temperature of +4˚C.
Precaution	Vaccinate animals above six months old. Vaccinated animals should be rested for 15 days after vaccination. The vaccine should not be freeze!
Side-effect	Hypothermia can occur at 48 hours, or between the seventh and fourteenth day after vaccination

C. Tetanus toxoid vaccine

The vaccines in equine species are similar to cattle (*see* Vaccines used in ruminants: Tetanus toxoid vaccine).

Description	Tetanus toxoid vaccine for Equidae is a filtrate of a culture in a liquid medium, or materials derived there from, of a suitable strain or strains of *Clostridium tetani* inactivated in such a manner that toxicity is eliminated and immunogenic activity is retained. The vaccine contains suitable adjuvant.
Dosage & administration	Varies from vaccine to vaccine hence it is important to follow the respective vaccine application guidelines of the manufacturers

III. Vaccines Used in Poultry

A. Avian coccidiosis vaccine

Indication	To avoid problems related to drug resistance and the continuous use of medication to control *Eimeria species* in domestic birds.
Dosage and administration	The vaccine is given in the drinking water as a single dose at between 5 and 9 days of age. A single dose is sufficient to protect broilers and replacement layer pullets.

B. Fowl pox vaccine

Description	It is a live freeze-dried vaccine.
Indication	To control or prevent fowl-pox infection in poultry.
Presentation	Each 20 ml vial contains 100 doses of freeze-dried vaccine.
Dosage & administration	Reconstitute the 100 doses with 2 ml of sterile cold-buffered solvent and vaccinate by transfixation of inner side of the wing membrane of each bird dip the stylet before vaccination into the viral suspension so that the groove is filled. Take care to touch

	the needle against the inside of the vial in order to remove adhering drops. The stylet is inserted from beneath through the wing web and care should be taken to push the feathers side so as to avoid damaging the blood vessels.
Vaccination program	Free environment: Vaccinate from the 8th week of life with an annual booster vaccination. Contaminated environment: Vaccinate from the 3rd week of life; booster 3 months later and then annual buster vaccinations.
Storage	The vaccine can be stored at +4˚C

C. **Fowl typhoid vaccine (live vaccine)**

Description	It is a live, freeze-dried vaccine of *Salmonella gallinarum* strain.
Indication	To control or prevent fowl typhoid in poultry.
Presentation	The vaccine is available in vials of 20 ml with 100 doses.
Dosage and administration	Reconstitute the vaccine in 50 ml cool sterile distilled or saline water. Inject 0.2 ml of the reconstituted vaccine by subcutaneous injection into the lower part of the neck. A single dose vaccine should be given at 6 weeks of age followed by a booster dose at 12 weeks of age.
Immunity	It appears in about 10 days. The vaccine confers protection for 6-8 months after two injections.
Storage	The vaccine can be stored at +4˚C for 6 months and at 20˚C for several years.

D. Marek's disease vaccine

Indication	Against Marek's disease in poultry
Dosage form	Powder for reconstitution
Dosage &	Chickens are ideally vaccinated at day-old in the hatchery, and

administration	also chickens up to 3 weeks of age may be vaccinated. Occasionally revaccination is done at 2 to 4 weeks of age. The vaccine is injected intramuscularly at 0.2 mg/chick.

E. Newcastle disease vaccine

✓ **Live Vaccines**

- Lasota and Hitner B1

Description	Lyophilized virus vaccine Hichner b1/Lasota strain. It is a freeze-dried vaccine.
Indication	To control or prevent Newcastle disease in poultry
Dosage and administration	***Ocular route*:** use an eyedropper. To calculate the volume of water required: Measure 1 ml of water to the dropper; count the number of drops in this 1 ml of water; calculate the volume of diluents required to dilute the number of doses of the vaccine per vial with the eyedropper in use. Volume of diluents (ml) = No. of doses of vaccine per vial / No. of drops formed per ml Example: how much diluents should be added to a vial containing 250 doses of NCD vaccine Volume of diluents (ml) = 250 doses per vial / 50 drops per ml = 5 ml per vial given that 1 ml of water in the eye-dropper yielded 50 drops. ***Oral drench*:** dissolve the 200 doses in 200 ml, the 100 doses in 100 ml and the 50 doses in 50 ml. administer by oral drench 1 ml of dissolved vaccine squirting into the beak of each bird using a clean plastic syringe. ***Drinking water*:** the quantity of water generally required per bird for the drinking water vaccination is as follows:

	For 10 -14 day-old birds	10-15 ml
	For 3 - 8 week-old birds	20-30 ml
	For other birds	40 ml

To calculate the volume of water required to dilute the vaccine, multiply the number of doses of the vaccine per vial by the amount of ml required per bird according to the above table.

Example: to dilute 500 doses of vaccine for 8 week-old birds, multiply 500 by 30, that means one needs 15 liters of water to dilute the 500 doses of vaccine per vials.

Vaccination program

Day of vaccination	Type of vaccine	Route of administration
Day old	HB1	Intraocular
Day 21	Lasota	Intraocular
Day 42	Lasota	By the drinking water
Between 10 and 12	Inactivated	Intramuscular (0.5 ml/bird)
At point of lay	Inactivated	Intramuscular (0.5 ml/bird)

Precautions:	The water used for reconstitution must be free from antiseptics. The chicken will not be given drinking water the evening before vaccination
Storage	Vaccines should be stored at +4˚C.

- ✓ **Newcastle thermo-stable vaccine**
  - **Description:** It is a live viral vaccine
  - **Indication:** To control or prevent Newcastle disease in poultry.
  - **Presentation:** The vaccine is available in vials of 250, 100 and 50 doses.

- **Dosage and administration (similar to live vaccine/ Lasota and Hitner B1)**
  - **Vaccination program**

- First vaccination: day old and above (preferably up to 10 days)
- Second vaccination: at 4 weeks of age
- Third vaccination: at 3-4 months of age; repeat every 3-4 months

- **Storage:** Since thermo-stable minority populations present in the relatively heat stable strain 12, the vaccine can be stored at +4˚C.

✓ **Inactivated oil emulsion Newcastle disease vaccine**

Description	The vaccine is prepared in embryonated eggs injected with the lentogenic strain Lasota. It is selected for its long-lasting immunity.
Indication	To control and prevent Newcastle disease in poultry.
Dosage and administration	The inactivated type of vaccine is recommended for flocks of lying and breeding birds. Shake well before and during use. Inject 0.5 ml vaccine per bird subcutaneously at the back of the neck or intramuscularly in the breast muscle. Only healthy poultry should be vaccinated.
Vaccination program	First vaccination should be given at10-12 weeks of age; While Second vaccination at point of lay. Best immunity is obtained when birds are vaccinated with live Newcastle vaccines prior to the application of inactivated vaccine.
Storage	Store the vaccine from +4˚C - 8˚C until it is used. Allow the vaccine to reach the room temperature (20˚C) before use.
Side-effect	Accidental injection of this vaccine to the vaccinator can cause localized reaction; in such occasion *see*k physician assistance.

Bacterial Vaccines Used in Dogs

IV. Vaccines Used in Dogs and Cats

- ✓ The four essential vaccines used in dogs against diseases that pose serious health threats to susceptible dogs are rabies, canine parvovirus, canine distemper and infectious canine hepatitis. Except for rabies, which is an inactivated vaccine, the other three types of vaccines are modified lives vaccines.

A. Canine adenovirus

Indication	Prevention infectious canine hepatitis in dogs
Presentation	Inactivated and modified live virus vaccines, separately one dose vials
Dosage & administration	Primary vaccination: first vaccination at 6-8 weeks old with inactivated vaccine; one dose 2 to 4 weeks later with modified live virus vaccine; Booster vaccination: at 9-11 weeks, followed by vaccination at 12-14 weeks of age.
Booster	Annual re-vaccination

B. Canine distemper vaccine

Indication	To prevent canine distemper infection in dogs
Presentation	One dose in a single vial in powder form
Dosage & administration	Reconstituted and injected IM or SC
Precautions	Puppies under 6 weeks of age should not be vaccinated.

C. Canine parvovirus vaccine

Indication	Against canine parvovirus infection.
Dosage form	Vial of 1 dose powder for reconstitution
Dosage and administration	Subcutaneous or intramuscular injection of 1 dose. Puppies are vaccinated at 2 to 4 weeks interval from 6 to 8 or 18 weeks of age. Although immunity following modifier live vaccine administration is probably of long duration, annual booster vaccination is

	recommended.
Precautions	Avoid vaccination of puppies less than 6 weeks of age.

D. Rabies vaccine

Many types of imported vaccines for use in domestic animals are in use locally. The safest vaccine produced on cell culture is mentioned here.

Description	An inactivated culture of Rabies virus.
Indication	Prevention and treatment of rabies in dogs and cats
Presentation	Single dose or multiple dose of 10
Dosage and administration	Primary vaccination: dogs/cats, at 3 months and cattle/horse at 6 months.1 ml SC or IM
Booster	Every three years
Precautions	After SC administration, a nodule many occasionally occur
Storage	+2 to +8ºC; Avoid freezing!

Self-Check 4	**Written test**

Name_____ ID _____Signature_____ Date_____

Directions: Answer all the questions below according to the instruction

Part I: Write "True" if the statement is correct or "False" if the statement is incorrect (10 Points)

1. The immune system is responsible for protecting the body from pathogens and foreign substances.
2. The thymus is involved in the maturation and education of B cells.
3. Innate immunity provides immediate, nonspecific protection against pathogens.
4. Antibodies are produced by T cells in response to specific antigens.
5. Phagocytes are immune cells that engulf and destroy pathogens through a process called phagocytosis.
6. Inflammation is a localized response to tissue damage or infection and involves the release of chemical mediators.
7. The complement system is a group of proteins that can directly kill pathogens, opsonize them for phagocytosis, and trigger inflammatory responses.
8. Humoral immunity is mediated by T cells and involves the production of antibodies.
9. Cell-mediated immunity is particularly effective against extracellular pathogens.

Part II: Choose the best answer for the following question (5 Points)

Which type of vaccine utilizes inactivated pathogens?

A. Live attenuated vaccines
B. Toxoid vaccines
C. Recombinant vaccines
D. Inactivated vaccines

2. Autogenous vaccines are specifically formulated for:

A. Individual animals
B. Large-scale commercial use
C. Zoonotic diseases
D. Viral infections

3. What is the primary role of serovaccines?

A. Inducing long-lasting immunity
B. Targeting bacterial toxins
C. Combining passive and active immunity

D. Utilizing genetic engineering techniques

4. Recombinant vaccines have been successfully used in which of the following animals?
   A. Livestock, such as cattle, pigs, and poultry
   B. Aquatic animals, such as fish
   C. Companion animals, such as dogs and cats
   D. All of the above
5. Which of the following is NOT an importance of vaccination in animals?
   A. Disease prevention
   B. Control of contagious diseases
   C. Environmental conservation
   D. Economic impact

Part III: Write Short Answer Questions (5 Points)

1. Vaccination schedules for animals may vary based on factors such as _____ interference, disease prevalence, and local regulations.
2. Proper vaccine storage and handling are crucial to maintain _____ and ensure vaccine efficacy.
3. Accurate and up-to-date _____ records should be maintained for each animal, including vaccine name, batch number, and administration date.
4. _____ is a vaccination strategy used in the control and eradication of infectious diseases, particularly those caused by highly contagious pathogens. It involves vaccinating individuals in a defined "ring" around an identified case of infection to create a buffer zone of immunity and prevent the spread of the disease.
5. _____ is a vaccination strategy used in animal disease control to create a buffer zone of vaccinated animals as a barrier against the spread of infectious diseases. It involves vaccinating animals in a specific geographic area surrounding an outbreak to prevent the further spread of the disease to neighboring populations.

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

LG #25	LO #5-Disease outbreak investigation and report writing

Instruction sheet 5

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

- Importance of disease outbreaks investigation
- Factors for occurrence of disease outbreaks
- Epidemiological investigation of diseases outbreaks
- Report writing based on principles and guide lines of OIE

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:

- Definition and importance of disease outbreaks investigation is described.
- Factors for occurrence of disease outbreaks described and identified.
- Epidemiological approaches to investigation of outbreaks are applied.
- Report writing is implemented based on the principles and guide lines of OIE

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks

Information sheet 5

5.1.Importance of disease outbreaks investigation

- A disease outbreak
  - ✓ It is the occurrence of cases of a particular disease in a population or geographical area that is greater than what is normally expected.
  - ✓ It is characterized by a sudden increase in the number of people affected by the disease within a specific time frame and location.
  - ✓ Can vary in size and severity, ranging from localized clusters of cases to widespread epidemics or pandemics affecting multiple regions or even countries.
  - ✓ Can be caused by various factors, including infectious agents, environmental factors, and exposure to toxins or chemicals.
  - ✓ The specific characteristics of an outbreak, including its duration, transmission patterns, and impact, depend on the nature of the disease and the population affected.

5.1.1. Methods of disease outbreak investigations

- Disease outbreak investigations in animals involve various methods aimed at identifying the cause of the outbreak, understanding its spread, and implementing appropriate control measures.
- It's important to note that disease outbreak investigations in animals often involve a multidisciplinary approach, combining clinical, epidemiological, and laboratory data to obtain a comprehensive understanding of the outbreak.
- The methods employed may vary depending on the nature of the disease, the species affected, and the available resources.
- Common investigation methods used in animal disease outbreaks:
  - ✓ **Field observations:**
    - Involve visiting the affected area or premises to gather information about the outbreak.
    - Veterinarians and animal health officials assess the clinical signs in affected animals, observe environmental conditions, and document any unusual occurrences or practices that may be relevant to the outbreak investigation.
  - ✓ **Epidemiological surveys**:

- It is conducted to gather data on the affected animals, such as their species, age, sex, breed, vaccination status, and management practices.
- These surveys help in identifying risk factors associated with the outbreak and understanding the patterns of disease spread within the population.

✓ **Laboratory diagnostics:**

- Play a crucial role in investigating animal disease outbreaks. Samples, including blood, tissue, feces, or swabs, are collected from affected animals and sent to diagnostic laboratories for analysis.
- Various diagnostic techniques, such as serology, polymerase chain reaction (PCR), culture, and histopathology, are employed to identify the causative agent and confirm the diagnosis.

✓ **Contact tracing:**

- Involves identifying and tracing the movement of animals that have been in contact with affected individuals or premises.
- It helps in understanding the transmission pathways and potential sources of infection.
- Contact tracing may involve interviewing animal owners, reviewing records, and conducting on-site investigations to identify and monitor potentially exposed animals.

✓ **Environmental sampling**:

- It involves collecting samples from the animal's living environment, such as water sources, feed, bedding, or vectors (e.g., mosquitoes or ticks).
- These samples are tested to determine if they are a potential source of the infectious agent or contribute to the disease transmission.

✓ **Data analysis and modeling:**

- Including statistical analysis and mathematical modeling, can aid in assessing disease patterns, estimating transmission rates, and predicting the future course of the outbreak.

- These methods help in making informed decisions regarding control strategies and resource allocation.

✓ **Collaboration and information sharing:**

- Collaboration and information sharing among veterinarians, animal health officials, researchers, and relevant stakeholders are crucial during outbreak investigations.
- Effective communication and coordination facilitate the timely exchange of information, experiences, and expertise, enabling a more comprehensive understanding of the outbreak and the implementation of appropriate control measures.

5.1.2. Importance of outbreak investigation

- Animal disease outbreak investigations are of paramount importance for several reasons.
- Importance of outbreak investigations are as follows:
  - ✓ To identify the source(s) of infection.
  - ✓ To prevent further exposure of animals to the infection source(s).
  - ✓ To determine where the disease has spread.
  - ✓ To guide control measures during and after the outbreak.
  - ✓ To improve knowledge on the behavior and pattern of disease.
  - ✓ To improve knowledge of the risks and routes of introduction.
  - ✓ To provide information that will allow stakeholders to better understand why outbreaks occur in their area, and factors that influence the severity of outbreaks if and when they occur

5.2. Factors for occurrence of disease outbreaks

- Several factors contribute to the occurrence of animal disease outbreaks.
- These factors can vary depending on the specific disease and the context in which it occurs.
- Common factors that play a role in the occurrence of animal disease outbreaks:

✓ **Pathogen characteristics:**

- The characteristics of the pathogen itself, such as its virulence, ability to survive in the environment, mode of transmission, and capacity to mutate, influence the likelihood and severity of disease outbreaks.
- Some pathogens are highly contagious and can spread rapidly among animals, increasing the risk of an outbreak.

✓ **Animal population density:**

- High population density, whether in farms, markets, or other settings, can facilitate the rapid transmission of diseases among animals.
- Close contact between susceptible individuals enables the efficient spread of pathogens, leading to outbreaks.

✓ **Animal movement and trade:**

- The movement of animals, whether for trade, transportation, or other purposes, can introduce and spread diseases across different geographic areas.
- Infected animals or contaminated materials can serve as sources of infection, contributing to the occurrence of outbreaks in previously unaffected regions.

✓ **Environmental factors:**

- Can influence the occurrence and spread of animal diseases. Factors such as temperature, humidity, rainfall, and the presence of vectors (e.g., mosquitoes, ticks) can impact the survival and transmission of pathogens.
- Environmental contamination, poor sanitation, and overcrowded or stressful conditions can also increase the risk of disease outbreaks.

✓ **Biosecurity practices:**

- The effectiveness of biosecurity measures implemented in animal production systems, such as farms and livestock facilities, can significantly influence the occurrence of disease outbreaks.
- Inadequate biosecurity practices, including poor hygiene, insufficient quarantine procedures, and lack of control measures, can facilitate the introduction and spread of pathogens within and between animal populations.

✓ **Vaccination and disease control programs:**

- The availability and use of vaccines and disease control programs are critical in preventing and mitigating the occurrence of disease outbreaks.
- Vaccination can reduce the susceptibility of animals to specific diseases, while effective control measures, such as diagnostic testing, surveillance, and prompt response to outbreaks, can help contain and manage disease incidents.

✓ **Socioeconomic factors:**

- Socioeconomic factors, including poverty, limited access to veterinary services, and inadequate infrastructure, can contribute to the occurrence of animal disease outbreaks.
- These factors may hinder disease surveillance, prevention, and control efforts, making populations more vulnerable to outbreaks.

✓ **Global trade and travel:**

- International trade of animals and animal products, as well as the movement of people, can introduce diseases to new regions.
- Globalization and increased travel facilitate the rapid spread of pathogens across borders, increasing the risk of disease outbreaks in previously unaffected areas.

✓ **Wildlife and environment interaction:**

- Interaction between domestic animals, wildlife, and the environment can serve as a source of disease transmission. Zoonotic diseases, which can be transmitted between animals and humans, often originate from wildlife reservoirs.
- Encroachment into natural habitats and changes in ecosystems can lead to increased contact and disease transmission between wildlife and domestic animals.

✓ **Climate change:**

- Climate change can influence the distribution and prevalence of diseases.
- Alterations in temperature, rainfall patterns, and ecological conditions can impact the geographic range of disease vectors, pathogens, and their hosts, potentially leading to changes in disease dynamics and the occurrence of outbreaks.

5.3. Epidemiological investigation of diseases outbreaks

- Epidemiological investigation plays a vital role in understanding and controlling animal disease outbreaks.
- These investigations involve systematic and scientific approaches to gather information, analyze data, and draw conclusions about the outbreak's characteristics, causes, and control measures.
- Key steps and components of epidemiological investigations for animal disease outbreaks:

✓ **Outbreak Confirmation and Notification**: The first step is to confirm the occurrence of an outbreak and notify relevant authorities, such as veterinary services, public health agencies, or international organizations. Timely reporting ensures a swift response and coordination of efforts.

✓ **Case Definition and Surveillance**: Establishing a case definition helps define and identify affected animals, including clinical signs, laboratory results, and other relevant criteria. Surveillance systems are implemented to detect and monitor cases, including active surveillance (proactive case finding) and passive surveillance (reporting of cases by veterinarians, farmers, or other stakeholders).

✓ **Descriptive Epidemiology**: Descriptive epidemiology involves collecting data on the outbreak, including the number of cases, affected species, locations, and time trends. This information helps characterize the outbreak and provides an initial understanding of its magnitude and distribution.

✓ **Data Collection and Analysis**: Epidemiological investigations involve collecting data through interviews, questionnaires, laboratory testing, and field observations. Data on animal demographics, movements, management practices, environmental factors, and potential risk factors are collected. Statistical and analytical methods are then used to analyze the data, identify patterns, and determine associations between risk factors and disease occurrence.

✓ **Source and Transmission Analysis**: Investigating the source and mode of transmission is crucial to understanding how the disease entered and spread within the population. This involves tracing back the origin of infected animals or

contaminated materials and identifying possible routes of transmission, such as direct contact, vectors, feed, water, or fomites.

- ✓ **Risk Factor Identification:** Epidemiological investigations aim to identify risk factors associated with the outbreak. These factors may include animal-related (e.g., age, species), environmental (e.g., housing conditions, biosecurity practices), and management-related factors (e.g., movement patterns, introduction of new animals). Analyzing these risk factors helps develop targeted control and prevention strategies.
- ✓ **Control Measures and Interventions:** Based on the investigation findings, control measures and interventions are recommended and implemented to prevent further spread and mitigate the outbreak's impact. These may include quarantine, movement restrictions, culling or depopulation of affected animals, vaccination, improved biosecurity measures, and communication strategies.
- ✓ **Follow-Up and Evaluation:** Monitoring the effectiveness of control measures is essential. Outbreak investigations involve ongoing evaluation to assess the impact of control measures, track disease trends, and make adjustments if necessary. Lessons learned from the investigation are applied to improve future response capabilities and preparedness.
- ✓ **Communication and Collaboration:** Epidemiological investigations require effective communication and collaboration among various stakeholders, including veterinary authorities, public health agencies, farmers, industry representatives, and international organizations. Clear and timely communication of findings and recommendations ensures a coordinated response and public awareness.

5.4. Report writing based on principles and guide lines of OIE

5.4.1. Report writing principles of OIE

- The World Organization for Animal Health (OIE) has established principles and guidelines for reporting and managing disease outbreaks in animals.
- Adhering to these principles ensures effective communication, coordination, and control measures.

- Key principles to consider when writing about disease outbreaks based on the guidelines of the OIE:
  - ✓ **Timely Reporting**:
    - Prompt reporting of disease outbreaks is essential to enable early detection and swift response. Timely information sharing facilitates the implementation of control measures and helps prevent further spread of the disease.
  - ✓ **Accuracy and Clarity**:
    - Disease outbreak reports should provide accurate and clear information regarding the affected animal species, geographical location, number of affected animals, clinical signs, and laboratory confirmation.
    - Use standardized terminology and avoid ambiguous or vague descriptions.
  - ✓ **Epidemiological Investigation**:
    - Conduct thorough epidemiological investigations to determine the source of the outbreak, transmission routes, and risk factors.
    - Include information on surveillance activities, diagnostic methods, and any findings related to the disease's spread and impact.
  - ✓ **Laboratory Confirmation**:
    - Laboratory testing plays a crucial role in confirming the presence of the disease and its specific causative agents.
    - Describe the diagnostic procedures employed, including sample collection, testing methods, and the accreditation status of the laboratories involved.
  - ✓ **Disease Control Measures**:
    - Outline the control measures implemented to contain the outbreak.
    - This includes quarantine measures, movement restrictions, enhanced biosecurity protocols, and disinfection procedures.
    - Highlight the OIE's guidelines followed for disease control and prevention.
  - ✓ **Collaboration and Communication:**

- Emphasize the importance of collaboration and communication among national veterinary authorities, relevant stakeholders, and international organizations.
- Describe the coordination efforts undertaken to share information, exchange expertise, and support control measures.

✓ **Compliance with International Standards:**

- Ensure that disease outbreak reporting and control measures align with international standards set by the OIE.
- This includes compliance with the Terrestrial Animal Health Code and other relevant guidelines specific to the disease in question.

✓ **Continual Improvement:**

- Reflect on the lessons learned from the outbreak and identify areas for improvement in disease surveillance, diagnostics, communication, and response strategies.
- Emphasize the need for continuous evaluation and enhancement of preparedness and response capabilities.

5.4.2. Report writing guide lines of OIE

- The World Organization for Animal Health (OIE) provides guidelines for writing animal disease outbreak reports to ensure consistency, accuracy, and effective communication.
- When writing an animal disease outbreak report based on OIE guidelines, consider the following:

✓ Report Structure:

- Follow a clear and logical structure with headings and subheadings.
- Include an executive summary or abstract at the beginning to provide a concise overview of the outbreak.

✓ Disease Information:

- Provide a detailed description of the disease, including its name, causative agent, and affected animal species.
- Include information on the clinical signs and the severity of the disease, as well as its impact on animal health, production, and trade.

✓ Outbreak Details:

- State the date and location of the first detection of the disease.
- Specify the affected animal populations, including species, age groups, and production types.
- Report the number of suspected, confirmed, and deceased animals, as well as the number of affected premises.

✓ Laboratory Confirmation:

- Describe the laboratory diagnostic procedures used to confirm the disease, including sample collection, storage, and transport.
- Provide information on the diagnostic tests employed and the laboratory's accreditation or certification status.

✓ Disease Control Measures:

- Outline the control measures implemented to contain the outbreak, including quarantine measures, movement restrictions, and control interventions.
- Describe the biosecurity measures applied, such as cleaning and disinfection protocols.
- Reference the OIE Terrestrial Animal Health Code for specific guidelines on disease control measures.

✓ Epidemiological Investigation:

- Detail the epidemiological investigations conducted to identify the source of the outbreak, transmission routes, and risk factors.
- Include information on surveillance activities, such as active and passive surveillance methods used.

- ✓ Communication and Collaboration:
  - Describe the communication strategies employed to inform relevant stakeholders, including veterinary authorities, farmers, and the general public.
  - Highlight any collaboration or coordination efforts with national or international organizations involved in disease control and response.

- ✓ Conclusion and Recommendations:
  - Summarize the key findings of the report, emphasizing the impact of the outbreak and the control measures implemented.
  - Provide recommendations for future actions, such as enhanced surveillance, improved diagnostics, or preventive measures.

- ✓ References:
  - Include a list of references used to gather information for the report, following appropriate citation guidelines.
  - Cite relevant OIE publications, including the Terrestrial Animal Health Code and specific diagnostic manuals.

5.4.3. Outbreak investigation reporting form

Epidemiological Investigation Reporting Form

Reporting Form ID: _____

Investigating Official: _____

Position Held: _____

Signature: _____

Investigation Date: _____/_____/_____

Section 1: Outbreak reporting

1.1 The officer was informed of this outbreak by:

[ ] Owner

[ ] Livestock volunteer in village or sub-district

[ ] Village or sub-district headman

Other (please specify):_____

1.2 Reporting Date: _____/_____/_____

Section 2: Index case

2.1 Name and address of owner of the first case:

_____

I) Village Name:_____

ii) Subdistrict/District/Province:_____

iii) Coordinates: X _____Y _____

2.2 Date the first signs of disease were noted: _____/_____/_____

2.3 Species of the first case

[ ] Cattle [ ] Buffalo **[ ]** Pigs **[ ]** Sheep **[ ]** Goats **[ ]** Poultry

Other (specify species):_____

2.4 If the first case was introduced from another area, please provide details:

i) Specify date of introduction: _____/_____/_____

ii) Specify source location: _____

2.5 Owner managed diseased animals by (answer all applicable options):

Slaughter (specify location)_____

Consumption or distribution (specify location)_____

Carcass disposal (burial or burning) (specify location)_____

Treatment (specify treatment)_____

Other (specify)_____

Section 3: List of cases

Owner Name: Village Name:

Village ID Number (if applicable): Sub district: District:									
Species	Total number susceptible	Number affected	Number of deaths	Number slaughtered/ destroyed	Date first animal affected	Date last animal affected (if applicable)	Vaccination History		Specify origin if introduced
							Vaccinated date	Vaccinated times	

Section 4: Clinical investigation

4.1 Clinical signs

[ ] Fever

[ ] Bleeding/hemorrhage

[ ] Drooling saliva

[ ] Anorexia

[ ] Respiratory signs

[ ] Jaundice

[ ] Abortion

[ ] Blisters on mouth/feet/udder

[ ] Neurological signs

[ ] Diarrhea

Other (specify) _____

4.2 Autopsy findings – please attach results (if applicable)

4.3 Sample collection (if applicable)

Sample ID: _____

Laboratory: _____

Sample Type: _____

Submission Date: _____/_____/_____

4.4 Laboratory findings – please attach results (if applicable)

Section 5: Environment

5.1 Animal husbandry in outbreak area (choose all applicable answers)

[ ] Farm

[ ] Grazing in defined area

[ ] Pen or stable

[ ] Free-grazing

Other (specify) _____

5.2 Please provide details of any shared water sources within the outbreak area:

_____

5.3 Name all livestock markets, slaughterhouses and animal collecting centres within a 10 km radius of the outbreak (if applicable)

Section 6: Risk factors and etiology

6.1 Have animal herds within the outbreak area received vaccination?

[ ] No

[ ] Yes

Date of vaccination _____/_____/_____

Lot _____

6.2 Have animal herds within a 5km radius of the outbreak area received vaccination?

[ ] No

[ ] Yes

Date of vaccination _____/_____/_____

Lot _____

6.3 Movement of possible reservoirs

Type of possible reservoir	Date of movement	Origin	Destination
Animals:			
Carcass or meat product:			
Animal feed:			
Farmers, traders or other people:			
Others			

6.4 If an outbreak of this nature has occurred within a 10km radius previously, please provide details:

i) Date of last outbreak _____/_____/_____

ii) Location of last outbreak _____

iii) Disease and serotype confirmed by laboratory (if applicable)_____

Please attach map(s) of outbreak location, water sources, livestock markets, slaughterhouses and animal collecting centers within a 10km radius of the outbreak area

Self-Check 5	**Written test**

Name_____ ID _____Signature_____ Date_____

Directions: Answer all the questions below according to the instruction

Part I: (5 Points)

1. Disease outbreak investigations in animals involve a multidisciplinary approach, combining clinical, epidemiological, and laboratory data.
2. Field observations during outbreak investigations involve assessing clinical signs in affected animals and documenting relevant environmental conditions.
3. Contact tracing in disease outbreak investigations helps identify and monitor potentially exposed animals and understand transmission pathways.
4. Laboratory diagnostics, including techniques such as serology and PCR, play a crucial role in identifying the causative agent and confirming the diagnosis during outbreak investigations.
5. Collaboration and information sharing among veterinarians, animal health officials, and relevant stakeholders are not important in disease outbreak investigations.

Part II: Multiple choices (1pt each)

1. What is the first step in an epidemiological investigation of an animal disease outbreak?
   A. Descriptive epidemiology
   B. Data collection and analysis
   C. Outbreak confirmation and notification
   D. Case definition and surveillance
   E. Source and transmission analysis
2. Which surveillance method involves proactive case finding?
   A. Active surveillance
   B. Passive surveillance
   C. Descriptive surveillance
   D. Analytical surveillance
   E. Sentinel surveillance
3. What does descriptive epidemiology involve in an outbreak investigation?
   A. Analyzing risk factors
   B. Tracing back the source of infection

C. Collecting data on the outbreak characteristics
D. Implementing control measures
E. Monitoring the effectiveness of interventions

4. Which step involves identifying associations between risk factors and disease occurrence?
   A. Outbreak confirmation and notification
   B. Case definition and surveillance
   C. Data collection and analysis
   D. Source and transmission analysis
   E. Risk factor identification
5. What is the purpose of communication and collaboration in epidemiological investigations?
   A. Implementing control measures
   B. Monitoring the effectiveness of interventions
   C. Tracing back the source of infection
   D. Analyzing risk factors
   E. Ensuring a coordinated response and public awareness
6. Which of the following is NOT a key principle to consider when writing about disease outbreaks based on the guidelines of the OIE?
   A. Timely Reporting
   B. Accuracy and Clarity
   C. Collaboration and Communication
   D. Financial Management
7. According to the OIE guidelines for writing animal disease outbreak reports, what should be included in the Disease Information section?
   A. Description of the affected animal species
   B. Number of affected premises
   C. Communication strategies employed
   D. Laboratory accreditation status
8. What should be outlined in the Disease Control Measures section of an animal disease outbreak report?

A. Epidemiological investigations
B. Surveillance activities
C. Control interventions and biosecurity measures
D. Accreditation status of the laboratories involved

9. In the Report Structure of an animal disease outbreak report, what should be included at the beginning to provide a concise overview of the outbreak?
   A. Executive summary or abstract
   B. References
   C. Laboratory confirmation details
   D. Communication and collaboration efforts
10. What should be detailed in the Epidemiological Investigation section of an animal disease outbreak report?
   A. Diagnostic procedures used for laboratory confirmation
   B. Timely reporting of the outbreak
   C. Surveillance activities and risk factors
   D. Compliance with international standards

Part III: Fill the black space with appropriate answer (3 Points)

1. The effectiveness of biosecurity measures implemented in animal production systems significantly influences the occurrence of disease _____.
2. International trade and travel can introduce diseases to new regions, increasing the risk of disease _____.
3. Climate change can influence the distribution and prevalence of diseases by impacting the geographic range of disease vectors, pathogens, and their _____.

Note: Satisfactory rating -9 points, Unsatisfactory -10 below

LG #26	LO #6. Participate the community in animal disease prevention

Instruction sheet 6

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

- Prevention strategies
  - ✓ Rotational grazing
  - ✓ Exclusion from infected areas
  - ✓ Genetic selection
- Prevention of herd mixing
- Isolation and treatment measure of animal

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

- Identify prevention and treatment strategies to resolve health issues, including rotational grazing, exclusion from infected areas, involving in the national development of immunity, genetic selection and treatment with drugs.
- Carry out prevention of mixing heard of different owners at watering, grazing points and isolation of those newly brought/returned from market.
- Take quick isolation of sick animal and appropriate measure.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks

Information sheet 6

6.1.Prevention strategies

- Prevention strategies are proactive measures and actions implemented to reduce the occurrence, impact, or spread of a specific problem or undesirable event.
- These strategies aim to identify and address potential risks, vulnerabilities, or underlying causes to prevent the occurrence or minimize the negative consequences of an undesired outcome.
- Diseases can have a significant impact on the health and well-being of animals. Implementing effective prevention strategies is crucial to minimize the occurrence and spread of these diseases.

6.1.1. Rotational grazing

- Implement appropriate pasture management practices to minimize exposure to parasites, especially in grazing animals.
- Instead of allowing animals to continuously graze in one area, rotational grazing involves dividing a pasture into smaller sections and rotating the animals through these sections over time.
- Here are some key aspects and benefits of rotational grazing:
  - ✓ Pasture Health
  - ✓ Improved Forage Quality
  - ✓ Parasite Control
  - ✓ Nutrient Cycling
  - ✓ Increased Carrying Capacity
  - ✓ Soil Health and Erosion Control
  - ✓ Weed Control
  - ✓ Cost Savings

6.1.2. Exclusion from infected areas

- A strategy for preventing the spread of diseases, including parasitic diseases, in animals
- It involves restricting the movement of animals into or out of areas known to be infected or at high risk of infection.
- Here's how exclusion can be utilized as a prevention measure:

- ✓ Quarantine
- ✓ Restricted Access
- ✓ Biosecurity Measures
- ✓ Movement Restrictions
- ✓ Surveillance and Monitoring
- ✓ Public Awareness and Education

6.1.3. Genetic selection

- A powerful tool in disease prevention and control in animals
- By selectively breeding animals with desirable genetic traits, including disease resistance or tolerance, it is possible to reduce the prevalence and impact of certain diseases.
- Here's how genetic selection can be utilized for disease prevention and control:
  - ✓ Disease Resistance
    - Traits: Genetic selection can target specific traits associated with disease resistance or resilience.
    - These traits can include natural immunity, increased resistance to parasites, improved immune response, or reduced susceptibility to certain diseases.
  - ✓ Selective Breeding Programs:
    - Implementing selective breeding programs allows breeders to choose animals with desirable disease-related traits as parents of the next generation.
    - Through careful selection and mating decisions, breeders can gradually increase the prevalence of genetic traits associated with disease resistance within a population.
  - ✓ Genomic Selection:
    - Genomic selection utilizes information from the entire genome of an animal to predict its genetic merit for disease resistance.
    - By analysing the genetic makeup of animals, including single nucleotide polymorphisms (SNPs) and other genetic variants, genomic selection can estimate an animal's genetic potential for disease resistance.
  - ✓ Genetic Testing and Screening:

- Genetic testing and screening can provide valuable information about an animal's genetic predisposition to specific diseases.
- By identifying animals carrying disease-causing or disease-susceptible genes, breeders can make informed decisions about breeding pair selection to minimize the risk of passing on genetic diseases to the offspring.

6.1.4. Avoid Overcrowding: Overcrowding can increase the risk of parasite transmission. Provide adequate space for animals to reduce stress and minimize the likelihood of disease transmission.

6.1.5. **Regular Veterinary Check-ups**: Schedule regular check-ups with a veterinarian to monitor your animal's overall health and identify any signs of infestations early on.

6.1.6. **Vaccination**: Follow a proper vaccination schedule recommended by your veterinarian. Vaccinations can help protect animals against certain diseases, such as heartworm disease, **tetanus……**

6.1.7. **Antibiotic Stewardship**: Practice responsible use of antibiotics to prevent the emergence of antibiotic-resistant bacteria. Only take antibiotics when prescribed by a healthcare professional, follow the prescribed dosage and duration, and never share or use leftover antibiotics.

6.1.8. **Prophylactic measures:** Antibiotics are primarily used for treating bacterial infections rather than preventing them. However, in some cases, antibiotics may be used prophylactically to prevent infections in certain high-risk situations. E. g. Oxytetracycline

6.1.9. **Environmental Management**: Maintain a clean and hygienic living environment for your animals. Regularly clean and disinfect kennels, bedding, litter boxes, and other areas where animals spend time. Dispose of faces promptly and appropriately to prevent the spread of parasites.

6.1.10. **Pest Control**: Implement effective pest control measures to minimize the presence of external parasites such as fleas and ticks in the animal's environment. This may include using insecticides, insect-repellent sprays, or insecticide-treated bedding.

6.1.11. **Quarantine and Testing**: Quarantine new animals before introducing them to the existing population. During the quarantine period, perform appropriate diagnostic tests to identify any underlying parasitic infections. This helps prevent the introduction of new parasites to the resident animals.

6.1.12. Education and Awareness: Stay informed about common parasites in your region and educates yourself about the signs, symptoms, and prevention methods associated with parasitic diseases.

6.1.13. **Sanitation**: Practice good sanitation measures, such as proper disposal of animal waste and regular cleaning of feeding and watering equipment. This reduces the chances of disease transmission through contaminated food or water.

6.2.Prevention of herd mixing

- It an important strategy in animal disease prevention, particularly in livestock and other group-housed animals.
- Herd mixing refers to the introduction or mingling of animals from different groups or populations, which can increase the risk of disease transmission.
- Measures taken to prevent herd mixing and minimize the spread of diseases:
- **Biosecurity Protocols:**
  - ✓ Implement strict biosecurity protocols on your farm or facility.
  - ✓ This includes controlling access to the premises, limiting visitors, and establishing designated entry points.
  - ✓ Enforce proper hygiene practices, such as hand washing, disinfection of footwear and equipment, and use of protective clothing or boots.
- Physical Barriers:
  - ✓ Use physical barriers to separate different animal groups and prevent direct contact.
  - ✓ Fencing, walls, or other physical structures can be utilized to maintain physical separation between herds or groups within a facility.
- Separate Facilities and Equipment:

- ✓ Ideally, provide separate housing, feeding areas, water sources, and equipment for different animal groups.
- ✓ This helps to minimize the risk of cross-contamination and disease spread between populations.

- Scheduled Management Practices:
  - ✓ This includes scheduling breeding, birthing, or other activities in a way that avoids overlapping groups and prevents unnecessary contact between animals.
- Quarantine and Testing:
  - ✓ Implement a quarantine period for new animals introduced to the farm.
  - ✓ Isolate and observe new additions for a specific period, while monitoring them for signs of illness.
  - ✓ Testing new animals for specific diseases before introducing them to existing populations.
- Controlled Movements:
  - ✓ Plan and coordinate animal movements within the facility to minimize the risk of disease transmission.
  - ✓ Avoid moving animals between groups unnecessarily and limit movement during periods of disease outbreak or high-risk situations.
- Record Keeping and Traceability:
  - ✓ Maintain detailed records of animal movements, including dates, sources, and destinations.
  - ✓ This helps to facilitate traceability and identify potential sources of disease outbreaks.
- Education and Training:
  - ✓ Provide education and training to farm staff and workers on biosecurity measures, disease recognition, and proper animal handling techniques.
  - ✓ Promote a culture of awareness and responsibility regarding disease prevention among the personnel involved.
- Collaboration and Information Sharing:

- ✓ Collaborate with veterinary professionals, industry experts, and neighbouring farms to exchange information, share best practices, and stay updated on disease trends and control measures.
- ✓ Participate in disease surveillance programs and reporting systems to contribute to early detection and response efforts.

- Monitoring and Surveillance:
  - ✓ Implement a robust monitoring and surveillance system to detect early signs of disease within animal populations.
  - ✓ Regularly observe animals for signs of illness, implement diagnostic testing when necessary, and promptly report any unusual health events to veterinary authorities.

6.3. Isolation and treatment measure of animal

- Isolation and treatment measures for animals are important components of disease prevention and control in animal populations.
- Here are some key considerations for isolation and treatment:

I. Isolation Measures:

- Separation: Immediately separate sick animals from healthy ones to prevent the spread of disease. Establish a designated isolation area or facility for housing and managing sick animals.
- Physical Barriers: Use physical barriers, such as fences or partitions, to physically separate sick animals from healthy ones. This helps to prevent direct contact and potential disease transmission.
- Biosecurity: Implement strict biosecurity protocols in the isolation area. This includes limiting access to the area, controlling movement of personnel, disinfecting equipment and footwear, and following proper hygiene practices.
- Adequate Space: Provide sufficient space and appropriate housing conditions in the isolation area to minimize stress and promote recovery in sick animals. Ensure proper ventilation, temperature control, and access to clean water and nutritious feed.
- Individual Care: Provide individualized care and attention to each isolated animal. This includes monitoring their health status, administering appropriate treatments as

prescribed by a veterinarian, and maintaining proper hygiene during handling and cleaning.

- Personal Protective Equipment (PPE): Use personal protective equipment, such as gloves, masks, and gowns, when handling or treating sick animals to prevent the transmission of zoonotic diseases and protect both animal and human health.

II. Treatment Measures:

- Veterinary Consultation:
  - ✓ Seek veterinary advice and consultation for the diagnosis, treatment, and management of animal diseases.
  - ✓ Veterinarians can provide guidance on appropriate medications, dosages, treatment duration, and other supportive care measures.
- Medications:
  - ✓ Administer medications as prescribed by a veterinarian.
  - ✓ This may include antibiotics, antiparasitic drugs, vaccines, or other specific treatments depending on the diagnosed disease.
- Supportive Care:
  - ✓ Provide appropriate supportive care to sick animals to aid their recovery.
  - ✓ This may include providing a balanced diet, ensuring access to clean water, maintaining cleanliness in the environment, and providing comfortable bedding.
- Hygiene and Sanitation:
  - ✓ Maintain proper hygiene and sanitation practices in the isolation area and during animal treatment.
  - ✓ Regularly clean and disinfect the area, equipment, and utensils to prevent the spread of pathogens.
- Monitoring and Follow-up:
  - ✓ Monitor the progress of treated animals closely.
  - ✓ Regularly assess their health status, response to treatment, and overall well-being. Follow up with veterinary consultations and adjust treatment protocols as necessary.

Self-Check 6	**Written test**

Name_____ ID _____Signature_____ Date_____

Directions: Answer all the questions below according to the instruction

Part I: **Part I: Write "True" if the statement is correct or "False" if the statement is incorrect (3 Points)**

1. Isolation measures involve physically separating sick animals from healthy ones to prevent disease transmission.
2. Biosecurity protocols are not necessary in the isolation area for managing sick animals.
3. Providing individualized care and attention to each isolated animal is important during their treatment.

Part II. Choose the best answer for the following question (12 Points)

1. Which of the following is NOT a prevention strategy for parasitic diseases in animals?
   A. Regular veterinary check-ups
   B. Quarantine and testing
   C. Genetic selection
   D. Overcrowding
2. What is the purpose of implementing biosecurity protocols in preventing herd mixing?
   A. To control access to the premises
   B. To separate different animal groups
   C. To schedule management practices
   D. To maintain physical barriers
3. Which prevention measure involves restricting the movement of animals into or out of areas known to be infected or at high risk of infection?
   A. Quarantine
   B. Restricted access
   C. Biosecurity measures
   D. Pest control
4. Which prevention strategy helps minimize exposure to parasites in grazing animals?
   A. Genetic selection
   B. Scheduled management practices
   C. Pest control
   D. Rotational grazing
5. What is the purpose of genetic selection in disease prevention and control?
   A. To implement biosecurity protocols
   B. To develop prophylactic measures
   C. To reduce the prevalence and impact of diseases
   D. To provide regular veterinary check-ups
6. Which prevention measure involves maintaining a clean and hygienic living environment for animals?

A. Pest control
B. Genetic selection
C. Environmental management
D. Antibiotic stewardship

7. What is the purpose of quarantine and testing in preventing herd mixing?
   A. To control access to the premises
   B. To separate different animal groups
   C. To observe new animals for signs of illness
   D. To facilitate traceability
8. What is the primary purpose of implementing strict biosecurity protocols on a farm or facility?
   A. To control access to the premises
   B. To separate different animal groups
   C. To maintain physical barriers
   D. To promote education and training
9. Which prevention strategy involves utilizing appropriate parasite control products recommended by a veterinarian?
   A. Genetic selection
   B. Environmental management
   C. Antibiotic stewardship
   D. Parasite control products
10. What is the importance of record keeping and traceability in preventing herd mixing?
    A. To control access to the premises
    B. To separate different animal groups
    C. To facilitate traceability and identify disease sources
    D. To promote education and training

Part III: Short Answer Questions (5 pts.)

1. How can rotational grazing help control parasites in grazing animals?
2. What is the purpose of quarantine and testing in the prevention of parasitic diseases?
3. How can Why is education and awareness important in the prevention of parasitic diseases?
4. genetic selection be used to prevent and control diseases in animals?

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

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