Animal Health

Level-IV

Based on March 2022, Version - 4 Occupational Standard



Module Title: - Carrying out Poultry Health Practice

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Ministry of Labor and Skills

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Introduction to the Module

This module covers the knowledge, skills and attitude required to develop detail understanding of poultry production, health management and carry out the identification, classification and handling of major infectious diseases and non-infectious diseases of poultry which are the serious constraints in poultry industry. The module also requires the knowledge and skills to implement poultry health management and biosecurity measures to prevent and control poultry diseases.

LG # 30	LO #1- Develop understanding of poultry production and health

Instruction sheet 1

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

- Introduction to poultry production systems
- Plan of Poultry Housing
- Poultry feeding and watering materials
- Classification of poultry breeds
- Challenges in the poultry industry
- Poultry feeding and nutrition

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 describe different poultry production systems.
- Determine poultry Housing plans
- Describe and specify feeding and watering materials and other tools
- Categorize poultry breeds on production.
- Describe husbandry related issues.
- Schedule nutrition plan.

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 poultry production systems

Poultry production involves several stages before poultry products reach consumers, including the rearing of these birds from hatch to peak performance and the subsequent harvesting and processing of broilers and eggs. Current poultry production in **Ethiopia** is estimated at 57 million birds, of these the 34.26% correspond to laying hens and 32.86% to broilers, which produce around 77,000 tons of meat annually. The per capita poultry and poultry product consumption in Ethiopia is one of the lowest in the world: 57 eggs and 2.85 kg of chicken meat per annum.





Figure 1: Poultry production system

A. Conventional/Traditional System:

- In this system, poultry production is carried out in indoor facilities, such as poultry houses or barns.
- The birds are typically raised in large groups or flocks.
- Conventional systems may use floor or cage housing, depending on the type of poultry.
- In the case of egg-laying hens, battery cage systems have been commonly used, although they are being phased out in some regions due to welfare concerns.
- The birds are provided with commercial feed, and their growth and health are closely monitored.
- This system allows for efficient production and management practices but may have limitations in terms of animal welfare and natural behavior expression.

B. Free-Range System:

- Free-range systems provide birds with access to outdoor areas in addition to indoor housing.
- The birds are able to roam and forage in a designated outdoor space during the day.
- The indoor housing provides shelter, nesting areas, and perches for the birds to rest and roost.
- This system allows for more natural behavior expression and access to sunlight and fresh air.
- However, it may also pose challenges in terms of predator control, exposure to weather conditions, and potential disease transmission.

C. Organic System:

- Organic poultry production follows specific guidelines and standards for organic farming.
- The birds are raised in an environment that promotes their natural behavior and well-being.
- Organic systems emphasize the use of organic feed, which is free from synthetic pesticides, antibiotics, and genetically modified ingredients.

- The housing and management practices in organic systems aim to minimize stress and promote the birds' overall health.
- Outdoor access and foraging opportunities are provided, similar to free-range systems.
- Organic poultry production is subject to certification and inspection to ensure compliance with organic standards.



This video accessed on: Training video #4 Poultry feed and water - #SWMProgramme September 27, 2023.

Figure 2 Poultry organ production system

1.2. Planning of Poultry Housing

Housing is necessary to protect chicken against predators, thieves, bad weather and to provide shelter for egg laying and broody hens. Some considerations for each type of poultry house plans:

i. **Brooder/Chick House:**
   - Adequate space for the number of chicks you intend to raise.
   - Proper insulation to maintain a warm temperature (around 95°F or 35°C) initially and gradually decrease it as the chicks grow.
   - Heating systems such as brooder lamps or electric heaters.
   - Good ventilation to ensure fresh air exchange.
   - Flooring with appropriate litter material for bedding.

ii. **Grower Poultry House:**
   - Sufficient space for the growing birds based on their expected size and number.
   - Proper ventilation to maintain good air quality and minimize the risk of respiratory diseases.
   - Feeding and watering systems suitable for the bird type.
   - Adequate lighting conditions.
   - Flooring with suitable litter material.

iii. **Layer Poultry House**:
   - Nest boxes for egg-laying hens.
   - Perches for roosting.
   - Sufficient space for the number of layers you plan to house.
   - Proper ventilation to maintain air quality and reduce ammonia levels.
   - Feeding and watering systems appropriate for layer birds.
   - Adequate lighting conditions for optimal egg production.

iv. **Broiler Poultry House:**
   - Sufficient space to accommodate the number of broilers you intend to raise.
   - Proper ventilation to remove moisture and ammonia and maintain good air quality.
   - Feeding and watering systems suitable for broilers.
   - Adequate lighting conditions for growth and feed efficiency.
   - Flooring with suitable litter material.

v. **Breeder Poultry House:**
   - Separate sections for male and female breeder birds.
   - Nest boxes or breeding areas.
   - Sufficient space for mating, egg production, and egg collection.
   - Proper ventilation to maintain air quality and minimize the risk of diseases.
   - Feeding and watering systems appropriate for breeders.
   - Adequate lighting conditions for breeding and egg production.

vi. **Environmentally Controlled Poultry House:**
   - Advanced environmental control systems for temperature, humidity, ventilation, and lighting.
   - Insulation to minimize heat loss or gain.
   - Proper air filtration systems to maintain air quality.
   - Automated feeding and watering systems.
   - Monitoring and control systems for environmental parameters.
   - Adequate space and layout for efficient management and access.

General consideration when plans poultry housing:

i. **Determine the Poultry Type and Purpose**: Decide on the type of poultry you intend to raise, whether it's chickens, ducks, turkeys, or another species. Also, consider the purpose, such as egg production, meat production, or both.

ii. **Size and Location**: Determine the size of the poultry house based on the number of birds you plan to raise. The house should provide sufficient space for comfortable movement, perching, nesting, and feeding. It should be located in an area with good drainage, protection from harsh weather conditions, and adequate ventilation.

iii. **Housing Design**: Choose an appropriate housing design based on the specific needs of your poultry. Common designs include:
   - **Open-Sided Houses**: These houses have open sides covered with wire mesh to allow natural ventilation.

- **Closed Houses**: Closed houses are more suitable for extreme climates and can be equipped with fans, evaporative cooling systems, or heaters as needed.
- **Battery Cages**: These are small wire cages used for commercial egg production. However, they are being phased out in some regions due to welfare concerns.

iv. **Flooring:** The flooring material should be easy to clean, provide good insulation, and prevent the accumulation of moisture and waste. Common options include concrete, slatted floors, or deep litter systems with bedding materials like straw or wood shavings.

v. **Nesting Boxes**: If you are raising laying hens, provide appropriate nesting boxes for them to lay eggs. Nesting boxes should be well-ventilated, clean, and comfortable, with sufficient privacy for the hens.

vi. **Feeding and Watering Systems**: Install appropriate feeding and watering systems based on the type and number of birds. This may include feeders, waterers, and automatic systems to ensure a continuous supply of fresh feed and water.

vii. **Lighting**: Proper lighting is essential for the growth, reproduction, and egg production of poultry. Install artificial lighting systems that provide the necessary light duration and intensity for the specific stage of production.

viii. **Biosecurity Measures**: Implement biosecurity measures to prevent the entry and spread of diseases. This may include controlled access, footbaths, disinfection protocols, and isolation/quarantine areas for new birds.

ix. **Ventilation**: Ensure proper ventilation to maintain good air quality and control temperature and humidity. Ventilation systems may include fans, air vents, or natural airflow through open sides or windows.

x. **Waste Management**: Design a waste management system to handle manure and waste products effectively. This may involve composting, regular cleaning, and proper disposal to prevent odor, contamination, and disease transmission.



Fig 3.a: One-sided house



Fig 3.b: Close house

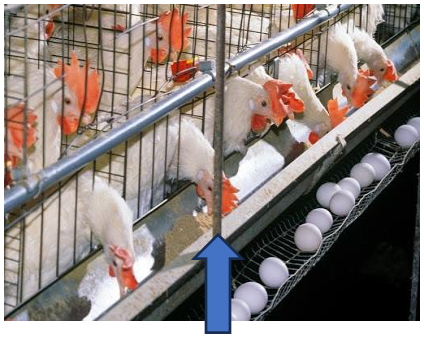


Fig 3.c: Battery house

1.3. Poultry feeding and watering materials

When it comes to feeding and watering poultry, there are various materials and equipment that can be used to ensure their nutritional needs are met and they have access to clean water. Here are some commonly used materials:

Feeding Materials:

i. **Feeders**: There are different types of feeders available, including trough feeders, tube feeders, and automatic feeders. These containers hold the feed and provide easy access for the poultry while minimizing waste.

ii. **Feed**: Poultry feed is available in different formulations depending on the age and purpose of the birds. It typically includes a combination of grains, protein sources, vitamins, and minerals. Common types of feed include starter feed, grower feed, layer feed, and broiler feed.

iii. **Grit:** Grit is small stones or insoluble materials that birds swallow to help them grind their food in the gizzard. It aids in digestion, especially for birds that have limited access to natural grit sources like soil or gravel.

iv. **Supplements**: Depending on the specific needs of the flock, supplements such as calcium, oyster shell, or poultry-specific minerals may be added to the feed to enhance their health and productivity.

Watering Materials:

i. **Waterers**: Waterers can come in various forms, including open dishes, troughs, or nipple drinkers. The choice of waterer depends on the age and size of the birds and the setup of the poultry housing.

ii. **Water**: Fresh and clean water should be available to poultry at all times. It is crucial for their overall health, digestion, and egg production. Make sure to regularly clean and refill the waterers to prevent contamination and ensure an adequate water supply.

iii. **Water additives**: Some poultry owners choose to add supplements or additives to the water, such as probiotics, electrolytes, or vitamins, to support the birds' health during stressful periods or to address specific concerns. These additives should be used as directed and appropriate for the flock's needs.



Fig 4. a Chicken feeder



Fig 4. b Chicken waterer

1.4. Classification of poultry breeds

Poultry breeds can be classified into various categories based on different characteristics such as purpose, type, origin, and physical attributes. Here are some common classifications of poultry breeds:

1. Purpose-based Classification:

- **Egg-laying Breeds:** These breeds are primarily raised for egg production. They are selected for their high egg-laying capabilities and traits such as good feed conversion and egg quality. Examples include Leghorn, Rhode Island Red, and Sussex.

- **Meat Breeds**: These breeds are specifically bred for meat production. They are known for their fast growth, efficient feed conversion, and desirable meat characteristics. Examples include Cornish Cross, Plymouth Rock, and Broilers.
- **Dual-purpose Breeds**: These breeds are suitable for both egg production and meat production. They possess a balance of egg-laying and meat-producing qualities. Examples include Rhode Island Red, Australorp, and Orpington.

2. **Type-based Classification:**

- **Chicken Breeds**: This category includes various breeds of domesticated chickens, such as Leghorn, Plymouth Rock, Wyandotte, and Orpington. Chicken breeds can further be classified based on their purpose, such as egg-laying breeds, meat breeds, or dual-purpose breeds.
- **Turkey Breeds**: Turkey breeds are specifically bred for meat production. Some common turkey breeds include Broad Breasted White, Narragansett, and Bronze.
- **Duck Breeds**: Duck breeds include breeds such as Pekin, Khaki Campbell, Rouen, and Muscovy. They are raised for meat, egg production, or both.
- **Goose Breeds**: Goose breeds include breeds such as Toulouse, Embden, and Chinese. They are primarily raised for meat production but may also be kept for other purposes like egg production or as ornamental birds.

3. **Origin-based Classification:**

Breeds can be classified based on their country or region of origin. For example, there are Mediterranean breeds (e.g., Leghorn, Ancona), British breeds (e.g., Sussex, Orpington), American breeds (e.g., Rhode Island Red, Plymouth Rock), and Asian breeds (e.g., Silkie, Brahma).
Physical Attribute-based Classification:

- **Feather Type**: Some breeds are known for their unique feather characteristics, such as the Silkie breed, which has fluffy, silk-like feathers.
- **Comb Type**: Breeds can be classified based on their comb type, such as single comb (e.g., Leghorn), rose comb (e.g., Rhode Island Red), or pea comb (e.g., Ameraucana).

- **Color Patterns**: Some breeds have distinct color patterns, such as Barred Plymouth Rock, Silver Laced Wyandotte, or the Speckled Sussex.

1.5. Challenges in the poultry industry

The poultry industry faces several challenges that can impact production, profitability, and sustainability. Some common challenges in the poultry industry include:

1. **Disease Outbreaks:** Poultry farms are susceptible to various diseases, such as avian influenza, Newcastle disease, and infectious bronchitis. Disease outbreaks can lead to significant economic losses, increased mortality rates, and trade restrictions. Maintaining strict biosecurity measures and implementing effective vaccination and disease prevention protocols are crucial.
2. **Feed Costs and Availability**: Poultry production heavily relies on feed, which represents a significant portion of production expenses. Fluctuations in feed ingredient prices, such as corn and soybean meal, can impact profitability. Competition for feed ingredients from other sectors, such as biofuel production, can also affect availability and drive-up costs.
3. **Antibiotic Resistance and Regulations**: The emergence of antibiotic resistance is a concern in the poultry industry, leading to stricter regulations on the use of antibiotics as growth promoters. Poultry producers must adopt alternative strategies for disease prevention and management, such as vaccination programs, improved biosecurity practices, and the use of probiotics or prebiotics.
4. **Market Volatility and Competition**: The poultry industry operates in a competitive market with fluctuating supply and demand dynamics. Price volatility, changing consumer preferences, and market disruptions can affect profitability. Poultry producers need to adapt to evolving market trends, maintain product quality, and differentiate themselves to stay competitive.
5. **Environmental Impact**: Poultry production can have environmental implications, including waste management challenges and potential pollution risks. Proper management of manure, water usage, and energy consumption is necessary to minimize environmental impact and comply with regulations. Implementing sustainable practices, such as utilizing renewable energy sources and improving waste management systems, is crucial.

6. **Animal Welfare Concerns**: Increasingly, consumers are concerned about animal welfare in the poultry industry. Meeting consumer demands for improved animal welfare, such as cage-free or free-range production systems, requires investment in infrastructure, changes in production practices, and compliance with animal welfare standards.
7. **Regulatory Compliance**: Poultry producers must comply with a range of regulations related to food safety, animal welfare, environmental protection, and labor standards. Complying with these regulations can require additional investments in infrastructure, training, and documentation, which may pose challenges for smaller producers.
8. **Global Trade and Economic Factors**: The poultry industry is impacted by global trade policies, tariffs, and geopolitical factors. Changes in trade agreements, import/export restrictions, and currency fluctuations can influence market access and profitability.

Notes: - Addressing these challenges requires a proactive and adaptive approach. Poultry producers need to invest in research and development, adopt advanced technologies, implement robust disease prevention measures, explore alternative feed sources, improve efficiency, and develop sustainable production practices. Collaboration among industry stakeholders, government agencies, and research institutions is crucial to finding solutions and promoting the long-term viability of the poultry industry.

Poultry husbandry issue

Poultry husbandry, or the management of poultry, involves various issues that farmers need to address for successful poultry production. Some common poultry husbandry issues include:

a. **Housing and Space:** Providing appropriate housing and sufficient space for poultry is essential. Overcrowding can lead to stress, aggression, and increased disease transmission among birds. Proper ventilation, temperature control, lighting, and bedding materials are crucial for maintaining a healthy and comfortable environment.
b. **Feeding and Nutrition**: Achieving proper nutrition is vital for poultry health and performance. Formulating balanced diets that meet the nutritional requirements of different poultry types and production stages is essential. Issues related to feed quality, availability,

and distribution must be managed to ensure optimal growth, egg production, and overall productivity.

c. **Water Management**: Access to clean and fresh water is critical for poultry health and productivity. Water sources should be regularly monitored, and appropriate waterers should be provided to ensure an adequate supply of water. Water quality and hygiene must be maintained to prevent the spread of diseases.

d. **Biosecurity**: Implementing effective biosecurity measures is crucial to prevent the introduction and spread of diseases. This includes controlling visitor access, practicing proper sanitation and hygiene, implementing quarantine measures for new birds, and controlling the movement of vehicles and equipment. Regular monitoring and vaccination programs play a key role in disease prevention.

e. **Parasite and Pest Control**: Poultry can be affected by parasites such as mites, lice, and worms, as well as pests like rodents and wild birds. Regular monitoring, appropriate treatment, and implementing pest control measures are necessary to prevent infestations and minimize the negative impact on poultry health and production.

f. **Health Management**: Maintaining good poultry health requires careful monitoring, early detection of diseases, and prompt veterinary intervention when necessary. Regular health checks, vaccination programs, and proper record-keeping are important aspects of poultry health management.

g. **Egg Management**: For egg-producing poultry, proper egg management is crucial to ensure egg quality, reduce breakage, and prevent the spread of diseases. This includes regular collection, cleaning, storage, and packaging of eggs according to industry standards.

h. **Flock Management**: Proper flock management involves monitoring and managing the performance and behavior of the birds. This includes monitoring growth rates, egg production, feed conversion ratios, and addressing any abnormalities or issues promptly. Flock culling, rotation, and replacement strategies are also important for maintaining the overall health and productivity of the flock.

i. **Vaccination Programs**: Vaccination plays a crucial role in preventing and controlling diseases in poultry. Implementing a well-designed vaccination program based on the specific disease risks in the region is essential. Different vaccines are available for various

diseases, including Newcastle disease, infectious bronchitis, Marek's disease, and others. Following proper vaccination protocols, storage and handling procedures, and keeping accurate vaccination records are essential for effective disease prevention.

j. **Lighting Management**: Proper lighting management is important for maintaining optimal production in poultry. Lighting duration, intensity, and spectrum can affect the reproductive and physiological processes of poultry. Providing the right light schedule is crucial for stimulating egg production, managing molting, and optimizing growth in broilers. Timely adjustments in lighting programs may be needed to meet specific production goals.

k. **Egg Incubation and Hatchery Management**: For hatcheries involved in breeding or commercial egg production, proper incubation and hatchery management are vital. Maintaining optimal temperature, humidity, ventilation, and turning of eggs during incubation is necessary for successful hatching. Monitoring egg fertility, embryo development, and ensuring proper sanitation in the hatchery are key factors in achieving high hatchability rates and producing healthy chicks.

l. **Genetics and Breeding**: Selecting and maintaining the right genetic stock is crucial for achieving desired production traits in poultry. Breeding programs focus on traits such as growth rate, feed conversion efficiency, egg production, and disease resistance. Proper selection, breeding, and maintaining genetic diversity are important to ensure the long-term success and sustainability of the flock.

m. **Record-Keeping and Data Management**: Maintaining accurate and detailed records is essential for effective poultry husbandry. Recording information about flock performance, health, vaccination history, feed consumption, and other management practices helps in monitoring progress, identifying trends, and making informed decisions. Effective data management systems, whether manual or digital, can assist in analyzing data and improving overall farm management.

n. **Worker Safety and Training**: Poultry farming involves various tasks that may pose risks to workers, such as handling equipment, working with live birds, and exposure to chemicals. Ensuring worker safety through proper training, providing personal protective equipment (PPE), and implementing safety protocols is crucial for maintaining a healthy and productive work environment.

o. **Environmental Management and Waste Disposal**: Proper management of waste, such as manure and bedding materials, is important to minimize environmental impact and prevent the spread of diseases. Implementing appropriate waste management systems, such as composting or waste utilization, helps in reducing pollution, odor control, and nutrient recycling.

1.6. Poultry feeding and nutrition

Poultry feeding and nutrition play a critical role in the health, growth, and productivity of poultry. Here are some key aspects of poultry feeding and nutrition:

a. **Balanced Diet:** Poultry require a well-balanced diet that provides essential nutrients in the right proportions. The diet should include carbohydrates, proteins, fats, vitamins, minerals, and water. Formulating a balanced diet involves considering the specific nutrient requirements of different poultry types (broilers, layers, breeders) and their different growth stages (starter, grower, finisher).

b. **Feed Ingredients**: Poultry feed is typically composed of a mixture of various feed ingredients. Common ingredients include grains (such as corn, wheat, and barley), protein sources (such as soybean meal, fish meal, and meat and bone meal), fats or oils, minerals, vitamins, and additives. The selection and quality of feed ingredients are important for meeting nutrient requirements, digestibility, and overall feed quality.

c. **Protein Requirements**: Poultry have high protein requirements for growth, feather development, and egg production. Protein sources should be of high quality, providing essential amino acids. Plant-based protein sources like soybean meal are commonly used, but animal-based protein sources can also be included in the diet.

d. **Energy Requirements**: Poultry require sufficient energy for metabolic functions, growth, and production. Energy sources in poultry feed come primarily from carbohydrates, such as grains and fats or oils. The energy content of feed is typically expressed in terms of metabolizable energy (ME) or net energy (NE).

e. **Vitamin and Mineral Supplementation**: Poultry diets need to be supplemented with essential vitamins and minerals to meet their specific requirements. These include vitamins such as vitamin A, vitamin D, vitamin E, vitamin K, B vitamins, and minerals like calcium,

phosphorus, sodium, and trace minerals (iron, zinc, copper, selenium). Commercially available vitamin and mineral premixes are often used to ensure proper supplementation.

f. **Feed Additives and Supplements**: Various feed additives and supplements can be included in poultry diets for specific purposes. These include probiotics, prebiotics, enzymes, organic acids, and phytogenic additives. They can enhance gut health, improve digestion, boost immunity, and promote overall performance.

g. **Feed Quality and Safety**: Ensuring feed quality and safety is crucial to prevent the introduction of contaminants or pathogens into the poultry diet. Proper storage, handling, and processing of feed ingredients and finished feed are important to maintain nutritional integrity and prevent spoilage or contamination.

h. **Feeding Management**: Proper feeding management involves providing the right amount of feed at the right time. Feed should be distributed in a manner that ensures all birds have access to feed and prevents wastage. Poultry farmers should monitor feed consumption, adjust feeding programs based on flock performance, and manage feed conversion ratios to optimize growth and production efficiency.

i. **Water Availability**: Access to clean and fresh water is essential for poultry health and digestion. Poultry should have continuous access to water, and waterers should be regularly cleaned and maintained to ensure water quality and prevent the spread of diseases.

j. **Nutritional Considerations for Specific Production Stages**: Nutritional requirements vary during different production stages. Starter feeds are formulated to meet the needs of young chicks, while grower and finisher feeds are designed to support growth and development. Layer diets are formulated to meet the nutritional requirements for egg production, while breeder diets focus on reproductive performance.

Certainly! Here are some ***additional details on poultry feeding and nutrition***:

a. **Feed Formulation**: Feed formulation is the process of determining the precise quantities of various feed ingredients to create a nutritionally balanced diet. It involves considering factors such as nutrient requirements, ingredient availability, cost, and desired production outcomes. Feed formulation can be done manually or by using computer-based software that takes into account nutrient values of ingredients and calculates the optimal diet composition.

b. **Feed Conversion Ratio (FCR):** Feed conversion ratio is a measure of how efficiently poultry convert feed into body weight gain or egg production. It is calculated by dividing the amount of feed consumed by the weight gained or eggs produced. Lower FCR values indicate better feed efficiency. Optimizing feed formulation, managing feeding programs, and monitoring FCR can help improve the economic efficiency of poultry production.

c. **Phase Feeding**: Phase feeding involves adjusting the nutrient composition of the diet based on the specific growth stage of the poultry. As birds grow, their nutrient requirements change. Phase feeding ensures that the diet meets the changing needs of the birds at each stage, which can improve growth rates, feed efficiency, and overall performance.

d. **Feed Additives for Health and Performance**: Various feed additives can be included in poultry diets to improve health, performance, and feed utilization. Probiotics and prebiotics promote a healthy gut microbiota, enhance digestion, and support immune function. Enzymes improve nutrient digestibility, especially for plant-based feed ingredients. Organic acids help control the growth of harmful bacteria in the digestive tract. Phytogenic additives derived from plants have antimicrobial and antioxidant properties.

e. **Alternative Feed Ingredients**: As the availability and cost of traditional feed ingredients fluctuate, there is growing interest in using alternative feed ingredients. These may include by-products from the food industry, such as wheat bran, corn gluten feed, or soybean hulls. Insects, such as black soldier fly larvae or mealworms, are also being explored as protein sources. However, careful evaluation is necessary to ensure their nutritional value, safety, and suitability for poultry diets.

f. **Feed Presentation**: The physical form of feed can influence poultry feeding behavior and nutrient utilization. Feed can be presented as mash, crumbles, or pellets. Mash is finely ground feed, while crumbles and pellets are processed into larger particles. Pelleted or crumbled feed can improve feed intake, reduce waste, and enhance nutrient digestibility. The choice of feed presentation depends on the age and type of poultry and specific farm requirements.

g. **Water and Electrolyte Balance**: Maintaining proper water and electrolyte balance is essential for poultry health and performance, especially during periods of heat stress or disease challenges. Electrolyte supplements can be added to the water to help replenish electrolytes lost through sweating or diarrhoea and to maintain hydration and electrolyte balance.

h. **Antibiotic Alternatives**: Due to concerns about antimicrobial resistance, there is increasing interest in finding alternatives to antibiotic growth promoters in poultry diets. This includes the use of probiotics, prebiotics, essential oils, plant extracts, and organic acids as natural alternatives to promote gut health, improve immunity, and enhance performance.

i. **Nutritional Considerations for Free-Range and Organic Production**: Poultry raised under free-range or organic production systems may have different nutritional requirements compared to conventionally raised birds. Access to pasture or forage can contribute to the nutrient intake of free-range poultry, but additional supplementation may be necessary to meet their nutritional needs.

j. **Monitoring and Evaluation**: Regular monitoring of flock performance, including body weight, feed intake, egg production, and egg quality, is important to assess the effectiveness of the feeding program. Nutrient levels in feed should be periodically analysed to ensure they meet the intended specifications. Adjustments to feed formulation or feeding strategies can be made based on the results of monitoring and evaluation.

Self-check 1	

Name_____ ID_____ Signature ____ Date_____

Directions: Answer all the questions below accordingly.

Part I: Choose the best answer (1 points)

1. The birds in the conventional system are typically raised in:
   A. Small groups or flocks
   B. Large groups or flocks
   C. Individual cages
2. The housing system used in conventional poultry production can be:
   A. Free-range system
   B. Floor housing system
   C. Cage housing system
3. In the case of egg-laying hens, the conventional system has commonly used:
   A. Battery cage systems
   B. Deep litter systems
   C. Pasture-based systems
4. In the case of egg-laying hens, the conventional system has commonly used:
   A. Battery cage systems
   B. Deep litter systems
   C. Pasture-based systems
5. The birds in the conventional system are provided with:
   A. Homemade feed
   B. Natural forage
   C. Commercial feed

Part II: Short Answer Questions (3pts each)

1. Describe the poultry production systems
2. What is main plan of Poultry Housing

3. List atleast the 6 poultry feeding and watering materials?
4. Describe the challenges in the poultry industry in Ethiopia?
5. Why we feeding and watering poultry in favorable condition?

Notes: Satisfactory rating – 10 points Unsatisfactory - below 10 points

LG # 31	LO #2- Identify and handle infectious disease of poultry

Instruction sheet 2

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

- OHS in poultry health management.
- Hygiene in poultry feeding and watering.
- Identifying and handling poultry diseases.
  - ✓ Viral diseases
  - ✓ Bacterial diseases
  - ✓ Parasitic diseases
  - ✓ Fungal diseases
- Public health and economic importance of infectious poultry diseases

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:

- Access PPE and use based on OHS guidelines.
- Select and check appropriate tools and equipment, feed and water containers
- Describe viral diseases of poultry based on their occurrence, clinical sign and symptoms, mode of transmission, laboratory and post mortem findings; and are handled
- Identify and handle bacterial diseases of poultry diseases
- Describe and identify parasitic diseases of poultry
- Identify and handle fungal poultry diseases
- Undertake diagnosis of diseases and differentiation.
- Identify causative agents by clinical signs and laboratory diagnosis
- Identify and implement treatments are prescribed, and prevention and control methods
- Identify and advice public and economic importance

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. OHS in poultry health management

Occupational health and safety (OHS) is an important aspect of poultry health management. It refers to the practices and procedures implemented to ensure the safety and well-being of workers who are involved in poultry production and health management. In poultry production, there are several hazards that can be present in the workplace. Here are some common hazards to be aware of:

A. **Zoonoses**: Zoonotic diseases are infections that can be transmitted between animals and humans. Poultry workers may be at risk of contracting diseases such as avian influenza (bird flu), salmonellosis, campylobacteriosis, or other respiratory infections. Proper hygiene practices, personal protective equipment (PPE), and vaccination programs can help reduce the risk of zoonotic diseases.
B. **Chemical Spillage**: The use of chemicals, such as disinfectants, pesticides, or cleaning agents, in poultry production can pose a risk if there is a spillage. Workers should be trained in the safe handling and storage of chemicals, and appropriate PPE should be worn when working with hazardous substances.
C. **Biological Hazardous Waste and Sharps Disposal**: Poultry production generates biological waste, including feathers, carcasses, and manure, which can be potentially hazardous. Proper waste management practices, including containment, disposal, and decontamination procedures, should be implemented. Sharps, such as needles or blades, should be disposed of safely to prevent injuries and the transmission of infectious agents.
D. **Handling of Chemicals and Medicines**: Workers involved in administering medications or chemicals to poultry need to follow proper handling procedures to avoid accidental exposure or ingestion. This includes using appropriate PPE, following dosage instructions, and understanding the potential hazards associated with the substances being used.

E. **Gas Leakage**: Gas-powered equipment, such as heaters or generators, can pose a risk of gas leakage if not properly maintained or installed. Regular inspections, proper ventilation, and the use of gas detectors can help prevent gas-related accidents or health issues.

F. **Inhalation of Aerosol Particles**: Dust, feathers, dander, or other airborne particles in poultry houses can lead to respiratory problems for workers. Adequate ventilation, dust control measures, and the use of respiratory protection equipment can help minimize the risk of inhalation hazards.

G. **Intraocular Contamination**: Poultry workers may be at risk of eye injuries or contamination due to exposure to flying debris, dust, or chemicals. Wearing appropriate eye protection, such as safety goggles or face shields, can help prevent eye injuries and minimize the risk of contamination.

H. **Manual Handling, Including Carrying, Lifting, and Shifting**: Poultry production often involves manual labor, such as carrying feed bags, moving equipment, or handling birds. Improper lifting techniques or overexertion can lead to musculoskeletal injuries. Training in proper lifting techniques, the use of mechanical aids, and implementing ergonomic practices can help reduce the risk of injuries.

I. **Needle Pricks and Cuts from Other Sharps**: Poultry workers who handle needles, syringes, or other sharp objects are at risk of needle pricks or cuts. Safe handling practices, the use of safety-engineered sharps, and proper disposal procedures can minimize the risk of injuries and bloodborne infections.

J. **Release of Infective Agents (Animal and Human):** Poultry workers may come into contact with infectious agents present in the poultry or from other workers. Following good hygiene practices, regular handwashing, and implementing biosecurity measures can help prevent the spread of infections.

K. **Slippery or Uneven Work Surfaces**: Poultry houses can have slippery or uneven surfaces due to wet floors, manure, or bedding materials. This increases the risk of slips, trips, and falls. Good housekeeping practices, regular maintenance of flooring, and the use of appropriate footwear can help prevent accidents.

It is essential to prioritize worker safety in poultry production by implementing appropriate safety protocols, providing training, and ensuring the use of personal protective equipment. Regular risk assessments, hazard identification, and adherence to safety guidelines can help mitigate workplace hazards.

2.2. Hygiene in poultry feeding and watering

Maintaining proper hygiene in poultry feeding and watering is crucial for the health and well-being of the birds. Good hygiene practices help prevent the introduction and spread of pathogens, minimize the risk of contamination, and promote optimal growth and production. Here are some important considerations for hygiene in poultry feeding and watering:

a. **Clean and Sanitary Feeders and Waterers**: Regularly clean and sanitize feeders and waterers to remove any accumulated feed, dirt, or debris. Use appropriate cleaning agents and follow manufacturer instructions. Rinse thoroughly to remove all traces of cleaning agents before refilling with fresh feed or water.
b. **Regular Inspection**: Routinely inspect feeders and waterers to identify any signs of damage, wear, or leakage. Damaged equipment can harbor bacteria, mold, or pests, compromising the cleanliness of the feed and water.
c. **Proper Placement**: Position feeders and waterers in a way that minimizes contamination. Ensure that they are elevated or hung at an appropriate height to prevent birds from soiling the feed or water with feces, litter, or bedding material.
d. **Adequate Space**: Provide enough feeding and watering space to prevent overcrowding and competition among the birds. Insufficient space can lead to spills, wastage, and increased contamination.
e. **Fresh and Clean Water**: Provide clean and fresh water to the poultry at all times. Regularly check and clean water sources, removing any algae, debris, or buildup. Ensure that waterers are functioning properly and are not leaking.
f. **Preventing Water Contamination**: Protect water sources from contamination. Keep waterers covered or use nipple drinkers to reduce the risk of fecal contamination. Prevent access by wild birds, rodents, and insects that can introduce pathogens into the water supply.

g. **Proper Feed Storage**: Store poultry feed in clean, dry, and vermin-proof containers. Protect feed from moisture, pests, and sunlight to prevent spoilage and contamination. Rotate feed stocks to ensure freshness and prevent the accumulation of mold or mycotoxins.
h. **Biosecurity Measures**: Implement biosecurity protocols to prevent the introduction and spread of diseases through feed and water sources. Control access to feed storage areas and limit exposure to potential sources of contamination, such as wild birds, rodents, or contaminated equipment.
i. **Regular Cleaning and Disinfection**: Establish a regular cleaning and disinfection schedule for feeders, waterers, and feeding areas. Use appropriate disinfectants that are effective against the target pathogens. Ensure thorough rinsing to remove any residue before reintroducing feed or water.
j. **Worker Hygiene**: Encourage and enforce good personal hygiene practices among workers involved in feeding and watering poultry. This includes proper handwashing before and after handling feeders, waterers, or feed, as well as the use of appropriate protective clothing and equipment.

By prioritizing hygiene in poultry feeding and watering, producers can help minimize the risk of disease transmission, improve feed efficiency, and promote the overall health and productivity of the flock. Regular monitoring, adherence to best practices, and collaboration with veterinarians or poultry specialists can further enhance hygiene protocols in poultry management.

2.3. Identifying and handling poultry diseases

Disease is an abnormal condition that is caused by infection, basic weaknesses, or environmental stress. A disease is defined by a specific group of signs or symptoms. Diseases prevent affected animals from functioning normally. **Health** is the overall condition of an animal at a given time. Disease causes this condition to weaken. This can result in poor productivity and reduced quality of the affected animals. It could even lead to the death/loss of one or all of the birds in a flock.

Diseases can be categorized by common causes, such as genetic, mechanical, toxic, and nutritional. Infectious diseases are caused by viruses, bacteria, and fungi. Parasitic diseases are caused by protozoa, worms, and external parasites such as mites and lice.

Infectious agents, commonly referred to as "germs," move from one susceptible bird to another in order to survive. For this to occur in a flock, a sufficient number of disease-causing agents must be able to gain access to the susceptible birds. These are birds that have no immunity or other resistance against these agents or whose defense mechanisms have been reduced or overwhelmed at the time of infection. The more infectious poultry diseases available in Ethiopia may be viral, bacteria, parasite and fungal diseases.

2.3.1. Viral diseases

A. Avian Influenza

Avian influenza (AI) is a respiratory disease of birds. AI viruses can infect chickens, turkeys, pheasants, quail, ducks, geese, and guinea fowl, as well as a wide variety of other birds. Migratory waterfowl seem to be a natural reservoir/host for AI viruses. Type A influenza viruses are classified according to the severity of illness they cause. AI viruses can be classified into **low pathogenic and highly pathogenic** based on the severity of the illness they cause in birds.

Clinical signs of HPAI:

- Sudden death without clinical signs
- Lack of energy and appetite
- Decreased egg production and/or soft-shelled or misshapen eggs
- Swelling of the head, eyelids, comb, wattles, and legs
- Purple discoloration of the wattles, combs, and legs
- Nasal discharge, coughing, and sneezing
- Lack of coordination
- Diarrhea



Treatment

- Appropriate supportive care,
- Monitoring
- the health of the flock, and implementing control measures.

Prevention of AI:

- House poultry indoors
- Avoid the use of farm ponds and bird feeders
- Avoid all contact with wild and domestic waterfowl
- Avoid live bird markets
- Control cats, rodents, beetles, insects, and other pests
- Seek diagnostic help on unusual deaths
- Avoid contact with your flock if working in poultry or swine processing
- Try to avoid sharing equipment
- If you share or borrow equipment, thoroughly clean and disinfect.

B. Newcastle diseases

Newcastle Disease is a contagious and fatal viral disease that affects all bird species. It is one of the most infectious poultry diseases in the world. ND is so deadly that many birds die without showing any signs of disease. In un-vaccinated poultry flocks, a death rate of almost 100 percent can occur, and ND can cause death even in vaccinated poultry.

Clinical Signs of ND

- Sneezing, gasping for air, nasal discharge, coughing
- Greenish, watery diarrhea
- Depression, muscular tremors, drooping wings, twisting of head and neck, circling, and paralysis

Treatment

- Providing clean water, proper nutrition, and a stress-free environment.
- Partial to complete drop in egg production.
- Production of thin-shelled eggs
- Swelling of tissues around the eyes and in the neck
- Sudden death and a high death rate in infected flock.



Prevention of ND:

- Sound vaccination programs and practicing biosecurity.

- Also, avoid contact with pet birds that belong to others, game fowl and live bird markets.

C. Infectious bronchitis diseases

Infectious bronchitis is a highly contagious viral respiratory disease that affects poultry, primarily chickens. It is caused by the infectious bronchitis virus (IBV), which belongs to the Coronaviridae family. Infectious bronchitis can result in significant economic losses in the poultry industry due to decreased egg production, poor growth, and increased susceptibility to secondary bacterial infections.

Here are some key points about infectious bronchitis in poultry:

- Transmission: The virus is primarily transmitted through respiratory droplets from infected birds. It can also spread indirectly through contaminated objects, such as equipment, clothing, and shoes. Wild birds and insects may also play a role in spreading the virus.
- Clinical signs: The signs of infectious bronchitis can vary depending on the strain of the virus and the age and immune status of the birds. Common clinical signs include respiratory distress, coughing, sneezing, nasal discharge, tracheal rales (rattling sounds), decreased feed intake, decreased egg production, and poor egg quality. In severe cases, mortality rates may increase, particularly in young birds.
- Diagnosis: Diagnosis of infectious bronchitis is typically based on clinical signs, history of exposure, and laboratory testing. Laboratory tests include virus isolation, serology (detection of antibodies), and molecular techniques such as polymerase chain reaction (PCR) to detect the presence of the virus.
- Prevention and control: Vaccination is an important tool for the prevention and control of infectious bronchitis. Vaccines are available against different strains of the virus, and the vaccination protocols may vary depending on the region and the specific strain of IBV present. Good biosecurity practices, such as strict hygiene measures, control of visitors and equipment, and isolation of new birds, are also crucial to prevent the introduction and spread of the virus on poultry farms.

- Treatment: There is no specific treatment for infectious bronchitis. Supportive care, including providing electrolyte solutions to prevent dehydration, administering anti-inflammatory medications to reduce inflammation in the respiratory tract, or using mucolytic agents to help thin mucus secretions.

D. Avian coronavirus diseases

Avian coronaviruses can cause various diseases in poultry, including respiratory, enteric, and reproductive disorders. The specific clinical signs, diagnosis, and treatment can vary depending on the type of avian coronavirus and the affected organ system. However, I can provide you with a general overview:

i. Cause: Avian coronaviruses belong to the Coronaviridae family and can infect birds, including chickens, turkeys, ducks, and others. The viruses are typically transmitted through direct contact between infected and susceptible birds, as well as through contaminated surfaces, equipment, and vectors such as insects and rodents.
ii. Clinical Signs: The clinical signs of avian coronavirus diseases depend on the specific virus and the affected organ system. Respiratory signs may include coughing, sneezing, nasal discharge, difficulty breathing, and decreased feed intake. Enteric signs can include diarrhea, decreased appetite, weight loss, and dehydration. Reproductive disorders may manifest as decreased fertility, poor hatchability, and abnormal eggs.
iii. Diagnosis: Diagnosis of avian coronavirus diseases involves a combination of clinical signs, history, and laboratory testing. Samples, such as respiratory secretions, feces, or tissue samples, may be collected for laboratory analysis. Techniques such as virus isolation, serology (detection of antibodies), and molecular methods like polymerase chain reaction (PCR) can be used to identify and differentiate avian coronaviruses.
iv. Differential Diagnosis: Differential diagnosis involves distinguishing avian coronavirus diseases from other poultry diseases with similar clinical signs. This may include assessing other respiratory pathogens, enteric viruses or bacteria, and reproductive disorders. Common differentials for respiratory signs may include Newcastle disease, infectious laryngotracheitis, and mycoplasmosis. For enteric signs, differential diagnoses may include

coccidiosis, salmonellosis, and other viral or bacterial enteritis. Reproductive disorders may be differentiated from other causes of poor hatchability and fertility issues.

v. Treatment: There is no specific antiviral treatment for avian coronavirus infections. Supportive care is use of anti-inflammatory medications to reduce inflammation in the respiratory tract, administering electrolyte solutions to prevent dehydration, or using mucolytic agents to help thin mucus secretions.

vi. Prevention and Control: Prevention and control of avian coronavirus diseases involve implementing strict biosecurity measures to prevent introduction and spread. This includes controlling access to farms, practicing good hygiene, disinfecting equipment, and implementing proper waste management. Vaccination is a crucial tool, and vaccines are available for specific avian coronavirus diseases such as infectious bronchitis. Vaccination protocols should be tailored to the specific strains prevalent in the region and the type of poultry.

E. Infectious laryngotracheitis (ILT)

ILT is a highly contagious viral respiratory disease that affects poultry, particularly chickens. It is caused by Gallid *herpesvirus* 1, also known as infectious laryngotracheitis virus (ILTV). ILT can cause significant economic losses in the poultry industry due to decreased production, increased mortality, and compromised flock health.

Here are some key points about infectious laryngotracheitis in poultry:

a. Transmission: ILT is primarily transmitted through direct contact between infected and susceptible birds. The virus is shed in respiratory secretions, including nasal discharge and ocular exudate, and can spread through respiratory droplets or direct contact with contaminated surfaces, equipment, or personnel. Recovered birds can become carriers and shed the virus intermittently, contributing to the persistence of the disease.

b. Clinical Signs: The clinical signs of ILT can vary in severity depending on the strain of the virus and the age and immune status of the birds. Common signs include respiratory distress, coughing, gasping, sneezing, nasal discharge, conjunctivitis (inflammation of the

eyes), and the production of bloody mucus in the trachea. Affected birds may also exhibit reduced feed intake, decreased egg production, weight loss, and increased mortality, especially in severe cases.

c. Diagnosis: Diagnosis of ILT is based on clinical signs, history, and laboratory testing. Laboratory tests, such as virus isolation, PCR, or serological tests, can confirm the presence of ILTV. Post-mortem examination may reveal characteristic lesions in the larynx and trachea, including hemorrhages, caseous exudate, and inflammation.
d. Treatment: There is no specific antiviral treatment for ILT. Supportive care is essential, including providing a clean and stress-free environment, good nutrition, and appropriate management practices. Secondary bacterial infections may occur, and antibiotics may be used to control these infections. Infected birds should be isolated to prevent further spread within the flock.
e. Prevention and Control: Prevention and control of ILT rely on a combination of biosecurity measures and vaccination. Good biosecurity practices include strict control of visitors and traffic, proper disinfection of equipment and facilities, and separation of different age groups or production units. Vaccination is an important tool for controlling ILT. Vaccines are available and can be administered via different routes, including eye drop, drinking water, or aerosol. Vaccination protocols should be developed based on the epidemiological situation and the specific needs of the flock.

F. Infectious bursal disease

Infectious bursal disease (IBD), also known as Gumboro disease or infectious bursal avian disease (IBAD), is a highly contagious viral infection that affects young chickens, primarily between three and six weeks of age. It is caused by the infectious bursal disease virus (IBDV), which belongs to the family Birnaviridae.

Here are some key points about infectious bursal avian disease:

a. Transmission: The IBD virus is primarily transmitted through the oral-fecal route. Infected birds shed the virus in their feces, contaminating the environment and infecting susceptible birds that come into contact with the virus. The virus can also be spread through contaminated water, feed, equipment, and even by insects and other vectors.

b. Clinical Signs: The severity of IBD can vary depending on the strain of the virus, the age and immune status of the birds, and the presence of concurrent infections. Clinical signs may include depression, loss of appetite, watery or bloody diarrhea, increased thirst, and increased mortality. The most characteristic sign of IBD is the damage to the bursa of Fabricius, an organ involved in the development of the immune system, which can lead to immunosuppression and increased susceptibility to secondary infections.
c. Diagnosis: Diagnosis of IBD is based on clinical signs, gross lesions, and laboratory testing. Post-mortem examination may reveal characteristic lesions such as swollen and hemorrhagic bursa of Fabricius, thymus atrophy, and kidney changes. Laboratory tests, such as virus isolation, PCR, and serological testing, can confirm the presence of IBDV.
d. Treatment: There is no specific treatment for IBD. Supportive care is important, including providing a clean and stress-free environment, good nutrition, and management of secondary bacterial infections. Antibiotics may be used to control secondary infections. Vaccination is the primary method for preventing IBD, as discussed in the next point.
e. Prevention and Control: Prevention and control of IBD primarily rely on vaccination. Vaccines for IBD are available and are commonly administered either in ovo (injected into the egg) or subcutaneously to day-old chicks. Vaccination protocols may vary depending on the prevalence of the disease in the area and the specific needs of the flock. Additionally, strict biosecurity measures, such as controlling access to the farm, disinfection of equipment and vehicles, and preventing contact with wild birds and vectors, can help reduce the risk of IBD introduction and spread.

G. Marek's disease

Marek's disease is a highly contagious viral disease that affects poultry, particularly chickens. It is caused by the Marek's disease virus (MDV), a herpesvirus belonging to the family Herpesviridae. Marek's disease primarily affects young chickens between 3 and 6 months of age, but it can also occur in older birds.

Here are some key points about Marek's disease:

i. Transmission: The Marek's disease virus is highly contagious and spreads through the respiratory route. Infected birds shed the virus in feather dander, skin cells, and dander from the respiratory tract. The virus can survive for long periods in the environment and can be transmitted through contaminated dust, litter, equipment, and even on the clothing and footwear of humans. Healthy birds become infected by inhaling virus particles.
ii. Clinical Signs: The clinical signs of Marek's disease can vary depending on the strain of the virus, the age of the bird, and the immune status of the flock. Marek's disease primarily affects the nerves, causing various neurological symptoms. Common signs include paralysis or weakness of the legs, wings, and neck, weight loss, depression, eye abnormalities (such as irregularly shaped pupils or blindness), and tumors in various organs (particularly the liver, spleen, and kidneys). In some cases, sudden death can occur without any prior signs.
iii. Diagnosis: Diagnosis of Marek's disease is based on clinical signs, gross lesions, and laboratory testing. Post-mortem examination may reveal characteristic tumors in affected organs. Laboratory tests, such as virus isolation, PCR, and serological testing, can confirm the presence of MDV or detect antibodies against the virus.
iv. Prevention and Control: Prevention and control of Marek's disease primarily rely on vaccination. Vaccines for Marek's disease are available and are commonly administered to day-old chicks either by subcutaneous injection or through the wing web. Vaccination helps to reduce the severity of the disease and the risk of tumor development. Strict biosecurity measures, such as controlling access to the farm, disinfection of equipment and vehicles, and preventing contact with wild birds, can also help reduce the introduction and spread of the virus.

v. Genetic Resistance: Some chicken breeds or genetic lines have varying degrees of resistance to Marek's disease. Selecting and breeding for resistance can be an additional strategy to control the disease in certain flocks.

2.3.2. Bacterial diseases

A. Infectious coryza, also known as avian coryza or cold, is a highly contagious respiratory disease that affects chickens and other poultry. It is caused by the bacterium Avibacterium *paragallinarum* (formerly known as Haemophilus *paragallinarum*). Here are some key points about infectious coryza:

i. Transmission: Infectious coryza is primarily transmitted through direct contact between infected and susceptible birds. The bacteria can be present in nasal and ocular secretions, as well as in contaminated water, feed, equipment, and surfaces. The disease can also be spread by inhalation of respiratory droplets from infected birds.

ii. Clinical Signs: Clinical signs of infectious coryza can vary in severity, depending on the strain of the bacterium and the immune status of the affected birds. Common signs include nasal discharge, facial swelling, swollen sinuses, watery eyes, sneezing, coughing, decreased appetite, decreased egg production, and a drop in overall flock health. The disease can cause significant economic losses due to reduced productivity in affected flocks.

iii. Diagnosis: Diagnosis of infectious coryza is based on clinical signs, gross lesions, and laboratory testing. Post-mortem examination may reveal characteristic lesions such as sinusitis (inflammation of the sinuses) and purulent nasal discharge. Laboratory tests, such as bacterial isolation and identification, can confirm the presence of Avibacterium *paragallinarum*.

iv. Treatment: Treatment of infectious coryza typically involves the administration of antibiotics (such as tetracyclines, **Sulfonamides** and in severe or resistant cases, fluoroquinolone antibiotics like ***enrofloxacin or ciprofloxacin***) to control secondary bacterial infections and reduce symptoms.

v. Prevention and Control: Prevention and control of infectious coryza rely on a combination of biosecurity measures, vaccination, and management practices.

- **Biosecurity**: Implementing strict biosecurity measures is vital to prevent the introduction and spread of infectious coryza. Measures include controlling access to the farm, disinfection of equipment and vehicles, and preventing contact with wild birds.
- **Vaccination**: Vaccination against infectious coryza is available and can be an effective strategy to reduce the severity of the disease and prevent its spread. Vaccination protocols may vary based on the specific needs and risk factors of the flock. Consultation with a veterinarian or poultry health specialist is recommended to determine the appropriate vaccination strategy.
- **Management Practices**: Maintaining good flock management practices, such as proper nutrition, ventilation, and hygiene, can help support the overall health and immune function of the birds and reduce the likelihood of disease outbreaks.

B. Pullorum disease

Pullorum disease, also known as Bacillary White Diarrhea or Salmonella *Pullorum* infection, is a highly contagious bacterial disease that primarily affects young poultry, particularly chicks. It is caused by the bacterium Salmonella Pullorum.

Here are some key points about Pullorum disease:

a. Transmission: Pullorum disease is primarily transmitted vertically, meaning it can be passed from infected hens to their offspring through infected eggs. The bacterium can also be transmitted horizontally through direct contact with infected birds, contaminated surfaces, equipment, feed, water, and through cannibalism of infected carcasses.
b. Clinical Signs: Pullorum disease primarily affects chicks and young poultry. Clinical signs may include depression, weakness, stunted growth, white or yellowish diarrhea, pasting of the vent area (causing the feathers to stick together), reduced feed intake, and high mortality rates. In adult birds, Pullorum infection may be asymptomatic or cause mild respiratory signs.
c. Diagnosis: Diagnosis of Pullorum disease is based on clinical signs, history of disease in the flock, and laboratory testing. Laboratory tests, such as bacterial isolation and identification, are used to confirm the presence of Salmonella Pullorum.

d. Treatment
    - **Ampicillin**: This antibiotic belongs to the penicillin class and is effective against Salmonella bacteria.
    - **Tetracycline**: Tetracycline antibiotics, such as oxytetracycline and chlortetracycline, are often used to treat bacterial infections in poultry, including Pullorum disease.
    - **Sulfonamides**: Sulfadimethoxine and sulfamethazine are examples of sulfonamide antibiotics that can be used to treat Pullorum disease.
e. Control and Eradication: Control and eradication of Pullorum disease are essential to prevent its spread and minimize economic losses. Measures include:
    - Testing and culling: Infected birds, including carriers, should be identified and culled to prevent further transmission.
    - Biosecurity: Strict biosecurity measures should be implemented to prevent the introduction of the bacterium into poultry flocks. This includes controlling access to the farm, disinfecting equipment and vehicles, and preventing contact with wild birds.
    - Sanitation: Thorough cleaning and disinfection of poultry facilities and equipment are crucial to eliminate the bacterium from the environment.
    - Egg testing: Regular testing of eggs for the presence of Salmonella Pullorum is important to identify infected flocks and prevent the spread of the disease through contaminated eggs.
    - Vaccination: Vaccination against Pullorum disease is available and can be used as part of control and eradication programs. Vaccination strategies vary depending on the specific needs and regulations of each region.

C. Salmonellosis

Salmonellosis, also known as fowl typhoid, is a bacterial disease that affects poultry, including chickens, turkeys, ducks, and other birds. It is caused by different serotypes of the bacterium Salmonella enterica. Here are some key points about salmonellosis (fowl typhoid):

i. Transmission: Salmonellosis in poultry can occur through vertical transmission (from infected hens to their offspring) or horizontal transmission (direct contact with infected birds, ingestion of contaminated feed or water, or exposure to contaminated environments). Salmonella can survive in the environment for extended periods and can be introduced into flocks through contaminated equipment, vehicles, or personnel.

ii. Clinical Signs: The clinical signs of fowl typhoid can vary depending on the species, age, and immune status of the birds, as well as the specific strain of Salmonella involved. Common signs may include depression, weakness, decreased feed intake, diarrhea (which may be greenish or blood-tinged), weight loss, anemia, increased mortality rates, and reproductive problems. Infected birds may also show respiratory signs, such as coughing or sneezing.

iii. Diagnosis: Diagnosis of fowl typhoid is based on clinical signs, history of disease in the flock, and laboratory testing. Laboratory tests, such as bacterial isolation and identification, are used to confirm the presence of Salmonella enterica and to determine the specific serotype involved.

iv. Treatment

- **Fluoroquinolones**: Fluoroquinolone antibiotics, such as ciprofloxacin and levofloxacin, are often effective against many strains of Salmonella. They work by interfering with bacterial DNA synthesis. However, fluoroquinolones are generally reserved for severe or resistant cases due to concerns about increasing antibiotic resistance.
- Third-Generation **Cephalosporins**: Cephalosporin antibiotics, particularly third-generation cephalosporins like ceftriaxone, are commonly used for severe cases of salmonellosis. They inhibit bacterial cell wall synthesis and can be effective against certain Salmonella strains.
- **Azithromycin**: Azithromycin, a macrolide antibiotic, is sometimes used as an alternative treatment for salmonellosis. It works by inhibiting bacterial protein synthesis. Azithromycin is particularly effective against invasive non-typhoidal Salmonella infections.

v. Control and Prevention: Control and prevention of fowl typhoid involve several measures, including:

- Biosecurity: Implement strict biosecurity practices to prevent the introduction and spread of Salmonella. This includes controlling access to the farm, disinfecting equipment and vehicles, and preventing contact with wild birds and rodents.
- Sanitation: Maintain proper hygiene and sanitation in poultry facilities, including regular cleaning and disinfection of premises, equipment, and water sources.
- Testing and culling: Infected birds, including carriers, should be identified and culled to prevent further transmission. Regular testing of flocks for Salmonella is crucial for early detection and control.
- Vaccination: Vaccination against fowl typhoid is available and can be used as part of control and prevention programs. Vaccination strategies may vary depending on the specific needs and regulations of each region.
- Feed and Water Management: Ensure that feed and water sources are free from contamination and implement good management practices to minimize the risk of exposure to Salmonella.

D. Fowl cholera

Fowl cholera, also known as avian cholera or Pasteurellosis, is a contagious bacterial disease that affects various bird species, including poultry, wild birds, and game birds. It is caused by the bacterium Pasteurella multocida.

Here are some key points about fowl cholera:

I. Transmission: Fowl cholera can be transmitted through direct contact with infected birds, ingestion of contaminated feed or water, and exposure to contaminated environments. The bacteria can also be spread through respiratory droplets, feces, and contaminated equipment or surfaces. Wild birds, such as waterfowl, can serve as carriers and reservoirs of the bacteria.

II. Clinical Signs: The clinical signs of fowl cholera can vary depending on the affected bird species, age, and immune status. Common signs may include depression, loss of appetite,

weakness, decreased egg production, respiratory signs (such as coughing, sneezing, and nasal discharge), swollen wattles or sinuses, diarrhea (which may be greenish or blood-tinged), and sudden death.

III. Diagnosis: Diagnosis of fowl cholera is based on clinical signs, history of disease in the flock, and laboratory testing. Laboratory tests, such as bacterial isolation and identification, are used to confirm the presence of Pasteurella *multocida*.

IV. Treatment

- **Tetracyclines**: Tetracycline antibiotics, such as oxytetracycline and chlortetracycline, are often effective against Pasteurella multocida. These antibiotics can be administered orally through the drinking water or in feed. They work by inhibiting bacterial protein synthesis.
- **Sulfonamides**: Sulfonamide antibiotics, such as sulfadimethoxine and sulfamethazine, may also be used to treat fowl cholera. These antibiotics work by inhibiting bacterial growth. They can be administered orally through the drinking water or in feed.
- **Fluoroquinolones**: Fluoroquinolone antibiotics, such as enrofloxacin and ciprofloxacin, are effective against Pasteurella *multocida*. However, the use of fluoroquinolones in poultry may have restrictions due to concerns about the development of antibiotic resistance.
- **β-Lactams**: In some cases, β-lactam antibiotics like amoxicillin or ampicillin may be used for the treatment of fowl cholera. These antibiotics work by interfering with bacterial cell wall synthesis. However, the susceptibility of Pasteurella *multocida* to β-lactams can vary, and their effectiveness may be limited.

V. Control and Prevention: Control and prevention of fowl cholera involve several measures, including:

- Biosecurity: Implement strict biosecurity practices to prevent the introduction and spread of fowl cholera. This includes controlling access to the farm, disinfecting equipment and vehicles, and preventing contact with wild birds.

- Sanitation: Maintain proper hygiene and sanitation in poultry facilities, including regular cleaning and disinfection of premises, equipment, and water sources.
- Testing and culling: Infected birds should be identified and culled to prevent further transmission. Regular testing of flocks for fowl cholera is crucial for early detection and control.
- Vaccination: Vaccination against fowl cholera is available and can be used as part of control and prevention programs. Vaccination strategies may vary depending on the specific needs and regulations of each region.
- Pest and rodent control: Implement measures to control pests and rodents that can transmit the bacteria.
- Water management: Ensure a clean and uncontaminated water supply for the birds.

E. Poultry campylobacteriosis

Campylobacteriosis is a bacterial infection caused by the pathogenic bacteria *Campylobacter*. It is a significant foodborne illness that can affect humans, and poultry, particularly chickens, is a common source of infection. Here's some information about Campylobacteriosis in poultry:

a. Transmission: Campylobacteriosis is primarily transmitted to humans through the consumption of contaminated poultry meat or the handling and preparation of raw poultry products. Poultry can become infected with Campylobacter through the ingestion of contaminated feed, water, or contact with carrier birds or contaminated environments.

b. Clinical Signs: In poultry, Campylobacter infection is often asymptomatic, meaning birds may not show any visible signs of illness. However, in some cases, it can cause mild to severe clinical signs such as diarrhea (which may be watery or bloody), reduced feed intake, weight loss, and poor growth. Infected birds may also exhibit decreased activity, ruffled feathers, and increased mortality rates.

c. Diagnosis: Diagnosis of Campylobacteriosis in poultry is typically confirmed through laboratory testing. This involves collecting samples, such as cloacal swabs or fecal samples, from live birds or post-mortem samples from affected birds. These samples are then cultured and tested for the presence of *Campylobacter* bacteria.

d. Treatment

- **Macrolides**: Macrolide antibiotics, such as erythromycin or azithromycin, are effective against Campylobacter infections. However, their use in poultry may be limited due to concerns about antibiotic resistance and potential impact on human health.
- **Fluoroquinolones**: Fluoroquinolone antibiotics like enrofloxacin or ciprofloxacin are also effective against Campylobacter. However, their use in poultry is generally discouraged to preserve their effectiveness in human medicine.

e. Control and Prevention: Controlling Campylobacteriosis in poultry is crucial to minimize the risk of human infection. Some preventive measures include:

- Biosecurity: Implementing strict biosecurity measures to prevent the introduction and spread of Campylobacter on poultry farms. This includes controlling access to the farm, limiting contact with wild birds, and proper sanitation practices.
- Hygiene and Sanitation: Maintaining clean and hygienic conditions in poultry housing and handling areas, including regular cleaning and disinfection of equipment, water sources, and premises.
- Feed and Water Management: Ensuring a clean and uncontaminated water supply and using good quality feed that is free from Campylobacter contamination.
- Vaccination: Although no commercial vaccines are available specifically for Campylobacter in poultry, vaccination against other diseases can help improve overall flock health and reduce stress, which may indirectly decrease the risk of Campylobacter infection.

2.3.3. Parasitic diseases

External parasites are common in poultry and can cause a range of problems, including discomfort, irritation, decreased production, and even disease transmission. Here are some common external parasites that affect poultry:

- **Lice**: Poultry lice are small, wingless insects that infest feathers and skin. They feed on blood and skin debris, causing irritation, feather damage, and decreased egg production. Lice eggs (nits) can often be found attached to feathers near the base. Common types of poultry lice include shaft lice and body lice.
- **Mites**: Poultry mites are tiny arachnids that infest the skin and housing of birds. They are nocturnal and feed on blood, causing irritation, anemia, feather loss, and decreased overall health. Common types of poultry mites include red mites, northern fowl mites, and scaly leg mites.
- **Fleas**: Fleas are small, wingless insects that infest the skin and feathers of birds. They can cause intense itching, discomfort, and irritation. Flea infestations are more common in outdoor or free-range poultry.
- **Ticks**: Ticks are external parasites that feed on the blood of birds. They can transmit diseases and, in large numbers, can cause anemia and stress. Ticks are commonly found in grassy or forested areas where birds have access.
- **Flies**: Certain fly species, such as blowflies and stable flies, can infest poultry houses and cause annoyance and stress to the birds. They can also transmit diseases and lay their eggs in manure or wet bedding material, leading to maggot infestations.
- **Bed Bugs**: Bed bugs are small, flat insects that infest poultry houses and can bite birds, causing discomfort and stress. They hide in cracks and crevices during the day and come out to feed at night. ***Treatment drugs*** choice for poultry lice, mite, lice, tick and bed bugs are:
    - ✓ **Insecticides**: Various insecticides are used to control lice in poultry. These may include:
        - Permethrin: Permethrin is a synthetic pyrethroid insecticide commonly used for lice control in poultry. It is available in different formulations, such as sprays, powders, or dusts. Permethrin works by interfering with the nervous system of the lice.

- Carbaryl: Carbaryl is a carbamate insecticide that can be used for the treatment of poultry lice. It is available as a dust or spray and works by disrupting the lice's nervous system.
- Organophosphates: Some organophosphate insecticides, such as malathion or diazinon, may be used for lice treatment in poultry. These insecticides work by inhibiting an enzyme called acetylcholinesterase, which is necessary for proper nerve function in lice.
- It's important to follow the manufacturer's instructions and veterinary guidance when using insecticides, as misuse or overuse can lead to resistance development or adverse effects.

✓ Ivermectin: Ivermectin is an antiparasitic drug that can be used to treat lice infestations in poultry. It is commonly available as an oral solution or injectable formulation. Ivermectin works by affecting the nervous system of lice and other parasites.

✓ Sevin Dust: Sevin dust, also known as carbaryl dust, is a widely used insecticide that can be effective against poultry lice. It is available as a powder and is applied directly to the bird's feathers to control lice.

Prevention and control of ***external parasites*** in poultry include:

- Regular inspection of birds for signs of infestations, such as feather damage, scabs, or excessive preening.
- Maintaining clean and well-ventilated housing with proper bedding material and regular cleaning and disinfection.
- Implementing effective biosecurity measures to prevent the introduction of parasites.
- Using approved insecticides or acaricides, following label instructions and withdrawal periods for the specific poultry species.
- Providing dust baths or dry areas with suitable dusting materials, such as diatomaceous earth, to allow birds to self-clean and control external parasites.
- Isolating and treating affected birds to prevent the spread of infestations.
- Regularly monitoring and managing the wild bird populations around poultry facilities, as they can be a source of external parasites.

Poultry tick (Argas persicus)

Argas persicus, commonly known as the poultry tick or fowl tick, is a species of soft-bodied tick that infests poultry and other birds. It is primarily found in warmer regions and can be a significant concern in poultry production systems. Poultry ticks are ectoparasites that feed on the blood of birds and can transmit diseases. Here's some information about the poultry tick (Argas persicus):

a. **Appearance:** Poultry ticks are relatively large compared to other common ticks, measuring around 5 to 10 millimeters in length. They have a soft, oval-shaped body and lack the hard shield (scutum) present in hard ticks. The color of the ticks can vary, but they typically have a reddish-brown to dark brown appearance.
b. **Life Cycle**: The life cycle of Argas persicus consists of several stages: egg, larva, nymph, and adult. Unlike hard ticks, soft ticks have multiple nymphal stages. The time required to complete their life cycle can vary depending on environmental conditions and availability of hosts. Poultry ticks are known for their ability to survive for long periods without feeding.
c. **Infestation and Spread**: Poultry ticks infest birds by crawling onto them from the environment. They can hide in cracks and crevices of poultry housing, such as walls, roosts, and nest boxes, and emerge to feed on birds during the night. Poultry ticks are particularly active in warm and humid conditions.
d. **Effects on Birds**: Poultry ticks feed on the blood of birds, which can lead to anemia, decreased growth, stress, and decreased egg production. Infested birds may show signs of discomfort, restlessness, reduced appetite, and feather pecking. Poultry ticks can also transmit diseases, including viral, bacterial, and protozoal pathogens.
e. **Control and Treatment**: Effective control and treatment of poultry ticks involve a combination of measures, including:
    - ✓ Regular inspection and monitoring of birds and poultry housing for signs of infestation.
    - ✓ Cleaning and disinfection of poultry housing, paying attention to cracks and crevices where ticks may hide.
    - ✓ Removal of debris and organic matter that can serve as hiding places for ticks.

- ✓ Application of approved acaricides or insecticides specifically labeled for poultry tick control. These may include sprays, dusts, or dips, and should be used according to the manufacturer's instructions.

- **Prevention:** Implementing good biosecurity practices can help prevent poultry tick infestations. This includes maintaining clean and well-maintained poultry housing, minimizing access to wild birds and potential tick carriers, and regularly inspecting new birds or equipment introduced to the flock.

A. Coccidiosis

Coccidiosis is a common and highly contagious parasitic disease that affects poultry, particularly chickens. It is caused by protozoan parasites of the Eimeria genus. Coccidiosis primarily affects the intestinal tract of birds and can lead to significant economic losses due to decreased growth, reduced feed conversion, and increased mortality. Here are some key points about coccidiosis in poultry:

- Transmission: Coccidiosis is mainly spread through the ingestion of sporulated oocysts shed in the feces of infected birds. These oocysts can survive in the environment for an extended period, contaminating litter, feed, and water sources. Healthy birds become infected by ingesting these oocysts.
- Life Cycle: The life cycle of coccidia involves different stages, including unsporulated oocysts, sporulated oocysts, sporozoites, and reproductive stages within the host's intestinal cells. The parasites multiply rapidly, causing damage to the intestinal lining and leading to the release of more oocysts into the environment.
- Symptoms: The severity of coccidiosis symptoms can vary depending on the species of Eimeria involved, the age and immune status of the birds, and the level of exposure. Common symptoms include diarrhea (which may be bloody), decreased appetite, dehydration, weight loss, decreased growth rate, decreased egg production (in layers), and increased mortality.
- Diagnosis: Diagnosis of coccidiosis is typically based on clinical signs, fecal examination for the presence of oocysts, and microscopic identification of the different Eimeria species.

Laboratory testing can help confirm the diagnosis and identify the specific species involved.

- Treatment
  - ✓ **Ionophores**: Ionophores are a class of anticoccidial drugs commonly used in poultry production. They work by disrupting the energy metabolism of the coccidia, thereby preventing their replication and reducing the severity of infection. Examples of ionophores used in poultry include ***monensin, salinomycin***, and l***asalocid***.
  - ✓ **Chemical coccidiostats**: Chemical coccidiostats are synthetic drugs that can be used to treat coccidiosis. They inhibit the growth and reproduction of the coccidia. Some commonly used chemical coccidiostats include ***amprolium, toltrazuril***, and ***decoquinate.***
- Prevention and Control:
  - ✓ Good Management Practices
  - ✓ Vaccination
  - ✓ Medication
  - ✓ Rotation Programs
  - ✓ Hygiene and Sanitation

B. Poultry worm parasite

Worms, also known as internal parasites, are a common issue in poultry and can cause various health problems. There are several types of worms that can infest poultry. Here are some of the most common ones:

i. Roundworms (Nematodes): Roundworms are the most prevalent internal parasites in poultry. They include species such as Ascaridia galli, *Heterakis gallinarum*, and *Capillaria* spp. These worms can infect the digestive tract, causing weight loss, poor growth, diarrhea, and nutrient deficiencies.

ii. Hairworms (Capillaria spp.): Hairworms are thin, thread-like worms that infest the crop, esophagus, and digestive tract of poultry. Severe infestations can lead to weight loss, anemia, and even death in young birds.

iii. Cecal Worms (Heterakis *gallinarum*): Cecal worms primarily infest the ceca (blind pouches located at the junction of the small and large intestine) of poultry. They can transmit a parasitic disease called Histomoniasis (Blackhead Disease), which affects turkeys and chickens.

iv. Tapeworms (Cestodes): Tapeworms can infest the intestines of poultry. Common species include Raillietina spp. and Choanotaenia spp. Tapeworm infestations may lead to weight loss, poor feed conversion, and nutrient deficiencies.

v. Gapeworms (Syngamus trachea): Gapeworms infest the respiratory system of poultry, particularly the trachea and bronchi. Infested birds may exhibit respiratory distress, gasping, coughing, and reduced growth rates.

Treatment to poultry worms is:

- **Benzimidazoles**: Benzimidazole drugs, such as **fenbendazole** and **albendazole**, are commonly used to treat a broad spectrum of gastrointestinal worms in poultry. These drugs work by interfering with the metabolism of the worms, leading to their paralysis and elimination.
- **Piperazine**: Piperazine is an anthelmintic drug that is effective against roundworms, such as Ascaridia spp., in poultry. It paralyzes the worms, allowing them to be expelled from the bird's digestive system.
- **Ivermectin**: Ivermectin is an antiparasitic drug that can be used to treat various types of worms in poultry, including roundworms and external parasites like mites and lice. It is available in oral or injectable formulations and works by affecting the nervous system of the worms.
- **Levamisole**: Levamisole is an anthelmintic drug used to treat roundworm infections in poultry. It paralyzes the worms, causing them to detach from the intestinal walls and be expelled from the bird.

Prevention and control of internal parasites in poultry include:

- Good biosecurity practices, including maintaining clean and well-ventilated housing, proper waste management, and minimizing contact with wild birds or contaminated areas.
- Regular cleaning and disinfection of poultry housing, equipment, and feeders.

- Rotational grazing or movement of poultry to fresh pasture areas to reduce exposure to infective stages of worms.
- Proper nutrition and feeding practices to promote overall health and immunity in birds.
- Regular fecal examinations to detect and monitor parasite infestations.
- Strategic use of deworming medications or anthelmintics, administered according to the manufacturer's instructions and withdrawal periods for poultry products.

2.3.4. Fungal diseases

The **mycoses** in poultry are caused by fungi, microscopic eukaryotic organisms, which include moulds and yeasts. There is a wide variety of fungal infections in birds, being the most relevant in poultry farming the aspergillosis, candidiasis and mucormycosis. Unlike mammals, dermatophytoses are not common in poultry. Fungal diseases can affect poultry and cause various health issues. Here are some examples of fungal poultry diseases:

A. Aspergillosis: is caused by various species of the fungus Aspergillus, with Aspergillus ***fumigatus*** being the most common culprit.

- **Clinical Signs:** Common signs include respiratory distress, gasping, coughing, sneezing, nasal discharge, reduced activity, poor growth, weight loss, and increased mortality. In severe cases, birds may exhibit open-mouth breathing and cyanosis (bluish discoloration) of the comb and wattles.
- **Diagnosis:**
  - ✓ Clinical signs (respiratory distress, coughing, and characteristic lesions in the respiratory system can raise suspicion).
  - ✓ Laboratory tests, such as fungal culture or microscopic examination of respiratory tract samples, can confirm the presence of Aspergillus spp.
- **Differential Diagnosis:**
  - ✓ Aspergillosis must be differentiated from other respiratory diseases in poultry, such as infectious bronchitis, Newcastle disease, avian influenza, mycoplasmosis, and other bacterial or viral respiratory infections.
- **Treatment:**

- ✓ Oral or injectable antifungal drugs, such as ***itraconazole or voriconazole***, may be prescribed by a veterinarian.
- ✓ Supportive care, including proper nutrition, hydration, and environmental management, is also important for the well-being of the birds.

B. Candidiasis: Fungus Candida spp., particularly Candida ***albicans.*** Candida is commonly found in the environment and the gastrointestinal tract of healthy birds.

- **Common signs**: poor growth, reduced feed intake, diarrhea, weight loss, and general weakness. In cases where the crop or esophagus is affected, white, cheesy plaques can be observed in the affected areas. These plaques can interfere with normal digestion and swallowing.
- **Dif. Dx:** clinical signs, history, and laboratory tests.
- **Differential Diagnosis:**
  - ✓ Candidiasis must be differentiated from other diseases that can cause similar clinical signs in poultry. Some potential differential diagnoses include viral or bacterial enteritis, malabsorption syndromes, or other gastrointestinal infections. A thorough evaluation of clinical signs, history, and appropriate diagnostic tests can help differentiate these conditions.

- **Treatment:**
  - ✓ The treatment of candidiasis in poultry typically involves antifungal medications. Oral or injectable antifungal drugs, such as **nystatin** or **fluconazole**, may be prescribed by a veterinarian. The duration of treatment may vary depending on the severity of the infection and the response to treatment. Supportive care, including proper nutrition and hydration, is also important for the affected birds' recovery.

C. Dermatomycosis

Dermatomycosis, also known as fungal skin infection or dermatophytosis, can affect poultry and is caused by various fungi, including Trichophyton spp. and Microsporum spp. Here's some information on dermatomycosis in poultry:

- **Cause:** Dermatomycosis in poultry is caused by the invasion of the skin by dermatophyte fungi.
- **Clinical Signs:**
  - ✓ Feather loss: Infected birds may experience feather loss, particularly in localized areas. The affected skin may appear red, inflamed, or scaly.
  - ✓ Skin lesions: Dermatomycosis can cause the development of crusty, scaly, or raised skin lesions. These lesions may be circular or irregularly shaped and can occur on various parts of the body, such as the head, neck, legs, or vent area.
  - ✓ Itching and discomfort: Infected birds may show signs of itching, scratching, or discomfort due to the presence of the fungal infection.
  - ✓ Secondary bacterial infections: In some cases, dermatomycosis can lead to secondary bacterial infections, as the compromised skin becomes susceptible to opportunistic bacteria.
- **Diagnosis:**
  - ✓ Combination of clinical signs, history, and laboratory tests.
- **Differential Diagnosis:**
  - ✓ Evaluation of clinical signs, history, and appropriate diagnostic tests can help differentiate these conditions.
- **Treatment:**
  - ✓ **Azoles**: Azole antifungal drugs, such as fluconazole and itraconazole, are commonly used to treat fungal infections in poultry. They work by inhibiting the synthesis of ergosterol, an essential component of fungal cell membranes.
  - ✓ **Polyenes**: Polyene antifungal drugs, such as nystatin and amphotericin B, are effective against various fungal species. They bind to the fungal cell membranes, leading to cell death.
  - ✓ **Allylamines**: Terbinafine is an example of an allylamine antifungal drug. It works by inhibiting the enzyme squalene epoxidase, which is necessary for fungal cell membrane synthesis.

- ✓ **Griseofulvin**: Griseofulvin is an antifungal drug that has been used for many years to treat dermatomycosis in both humans and animals. It disrupts fungal cell division and inhibits fungal growth.

D. Mycotoxicosis

Mycotoxicosis refers to the toxic effects caused by the ingestion of mycotoxins, which are toxic substances produced by certain molds or fungi.

- **Cause:** these mycotoxins are produced by certain molds, such as *Aspergillus* spp., Penicillium spp., Fusarium spp., and others, which can grow on crops, grains, or feed ingredients under certain conditions, particularly when there is high moisture content, improper storage, or poor-quality control.
- **Clinical Signs:** Some common clinical signs seen in poultry include:
  - ✓ Reduced feed intake: Poultry may show decreased appetite or reluctance to consume feed.
  - ✓ Poor growth: Mycotoxins can interfere with nutrient absorption and utilization, leading to stunted growth or reduced weight gain.
  - ✓ Immunosuppression: Mycotoxins can weaken the immune system, making birds more susceptible to infections and diseases.
  - ✓ Digestive disturbances: Mycotoxins can cause digestive disturbances such as diarrhea, vomiting, or changes in fecal consistency.
  - ✓ Reproductive issues: Certain mycotoxins can affect reproductive performance, leading to decreased egg production, poor hatchability, or fertility issues.
  - ✓ Neurological signs: In some cases, mycotoxins can affect the nervous system, resulting in tremors, ataxia, or other neurological abnormalities.
- **Diagnosis:** However, the following approaches can aid in diagnosis:
  - ✓ ***Clinical signs and history***: Observing the characteristic clinical signs and obtaining a thorough history of feed sources and management practices can provide clues.
  - ✓ ***Feed analysis***: Analyzing feed samples for the presence of mycotoxins using laboratory tests, such as high-performance liquid chromatography (HPLC) or

enzyme-linked immunosorbent assay (ELISA), can confirm the presence and levels of mycotoxins.

- **Differential Diagnosis:** evaluation of clinical signs, history, and appropriate diagnostic tests can help differentiate these conditions.
- **Treatment:** in poultry primarily involves supportive care and management strategies. This includes:
  - ✓ **Removal of contaminated feed sources**: Identifying and removing the source of mycotoxin contamination is crucial to prevent further exposure.
  - ✓ **Nutritional support:** Providing a well-balanced diet with additional supplementation, if necessary, to compensate for nutrient imbalances caused by mycotoxins.
  - ✓ **Supportive therapy:** Addressing specific clinical signs, such as administering fluids for dehydration, antibiotics for secondary infections, or other supportive medications as deemed necessary by a veterinarian.

Prevention and control of fungal poultry diseases involve several measures:

- Maintaining good hygiene and cleanliness in poultry housing, including regular cleaning and disinfection.
- Proper ventilation and moisture control to prevent the growth of mold and fungi.
- Managing feed storage to minimize mold growth and mycotoxin contamination.
- Avoiding overcrowding and providing adequate space for birds to reduce stress and prevent the spread of fungal infections.
- Implementing biosecurity practices to prevent the introduction of fungal spores to the poultry environment.
- Proper nutrition and feeding practices to support the birds' immune system and overall health.
- Prompt veterinary attention and diagnosis in case of suspected fungal infections, as some antifungal medications may be required for treatment.

Handle poultry diseases

a. Regular Observation: Conduct regular and thorough observations of your flock. Pay attention to any changes in behavior, appearance, or production performance. Look for signs such as decreased feed consumption, reduced water intake, lethargy, respiratory distress, abnormal feces, lameness, or sudden changes in egg production.
b. Diagnostic Tools: Work with a veterinarian or poultry health professional to utilize diagnostic tools for disease identification. This may include laboratory testing of samples such as blood, swabs, or tissue to determine the specific disease causing the problem.
c. Disease-Specific Symptoms: Familiarize yourself with common symptoms associated with different poultry diseases. Some examples include respiratory distress for Newcastle Disease, diarrhea for Coccidiosis, or swollen joints for Infectious Arthritis. Understanding these symptoms can help you narrow down the potential diseases affecting your flock.
d. Veterinary Consultation: If you suspect a disease outbreak or notice unusual signs, consult with a veterinarian or poultry health professional. They can provide expert advice, conduct further diagnostic tests if need, and help you develop a proper treatment and management plan.
e. Isolation and Quarantine: If a disease is suspected or confirmed, immediately isolate affected birds from the rest of the flock to prevent the spread of the disease. Establish a quarantine area for new birds before introducing them to your existing flock to minimize the risk of introducing diseases.
f. Biosecurity Measures: Implement strict biosecurity measures to prevent the entry and transmission of diseases. This includes controlling access to the farm, limiting visitors, maintaining hygiene, and preventing contact with wild birds, rodents, and contaminated equipment.
g. Treatment and Management: Follow the guidance of your veterinarian for disease-specific treatment and management protocols. This may involve administering appropriate medications, adjusting feed and water quality, providing supportive care, or implementing vaccination programs.
h. Record Keeping: Maintain accurate records of vaccination history, disease outbreaks, mortality rates, and production performance. This information can help in identifying patterns, tracking trends, and making informed management decisions.

i. Education and Training: Stay informed about common poultry diseases, their symptoms, and control measures. Attend workshops, training programs, or seminars on poultry health management to enhance your knowledge and skills.
j. Continual Monitoring: Regularly monitor the health status of your flock even after recovering from a disease outbreak. This helps ensure early detection of any recurring or new diseases.

2.4. Public health and economic importance of infectious poultry diseases

Infectious poultry diseases have significant public health and economic implications due to their potential to affect both human health and the poultry industry. Here's an overview of the public health and economic importance of infectious poultry diseases:

Public Health Importance:

a. **Zoonotic Potential**: Several infectious diseases of poultry have zoonotic potential, meaning they can be transmitted from animals to humans. Examples include avian influenza (AI), Salmonella, Campylobacter, and certain strains of Escherichia coli. These diseases can cause illness, ranging from mild gastrointestinal symptoms to severe respiratory infections, and in some cases, they can be fatal. Proper handling and cooking of poultry products are essential to prevent human infections.
b. **Pandemic Risk**: Certain strains of avian influenza, such as highly pathogenic avian influenza (HPAI) H5N1 and H7N9, pose a significant concern for public health. These viruses have the potential to undergo genetic mutations and acquire the ability to transmit efficiently between humans, potentially leading to a global influenza pandemic. Prompt detection, surveillance, and control measures in poultry populations are critical to minimizing the risk of such pandemics.
c. **Antibiotic Resistance**: The use of antibiotics in poultry production to treat and prevent infectious diseases can contribute to the development and spread of antibiotic-resistant bacteria. These resistant strains can pose challenges for human health when they cause infections in humans and cannot be effectively treated with commonly used antibiotics.

Responsible antibiotic use practices and surveillance are necessary to mitigate antibiotic resistance risks.

Economic Importance:

a. **Trade Restrictions:** Outbreaks of certain infectious diseases in poultry can lead to trade restrictions imposed by importing countries. When a disease is detected in a country or region, other countries may ban or restrict the importation of live birds, poultry products, or breeding stock from the affected area. These trade restrictions can have severe economic consequences for poultry producers, exporters, and the overall poultry industry.
b. **Loss of Production**: Infectious diseases can cause significant morbidity and mortality in poultry flocks, resulting in reduced production levels. This can lead to lower meat, egg, or breeding stock output, affecting the supply and availability of poultry products in the market. Disease outbreaks may require the culling or depopulation of infected or exposed birds to control the spread of the disease, further impacting production and profitability.
c. **Increased Production Costs**: Managing and controlling infectious diseases in poultry often requires additional resources, such as veterinary services, diagnostic testing, biosecurity measures, vaccines, and medications. These costs can be substantial and add to the overall production expenses, reducing profit margins for poultry producers.
d. **Market Reputation**: Frequent or poorly controlled outbreaks of infectious diseases in poultry can damage the reputation of a country or region as a reliable source of safe and disease-free poultry products. Consumers and importers may lose confidence in the quality and safety of poultry products from affected areas, leading to a decline in demand and market share.
e. **Livelihoods and Employment**: The poultry industry plays a significant role in providing employment and livelihood opportunities, particularly in rural areas. Disease outbreaks and subsequent control measures can disrupt poultry production, leading to job losses, reduced incomes, and economic hardships for those dependent on the industry.

Notes: To mitigate the public health and economic impacts of infectious poultry diseases, proactive measures such as enhanced biosecurity, surveillance programs, vaccination, and

proper disease management practices are essential. Collaboration between veterinary services, poultry producers, public health agencies, and international organizations is crucial for effective disease control and prevention, safeguarding both public health and the poultry industry.

Appropriate specimen for poultry diseases examination

When investigating infectious diseases in poultry, different types of samples may be collected depending on the specific disease being investigated. Here are some common sample types collected for specific infectious diseases in poultry:

- **Whole blood**: Whole blood samples can be collected for various purposes, such as serological testing or molecular diagnostics. Blood samples can provide information about the immune response of the bird and may be used to detect antibodies or DNA/RNA of specific pathogens.
- **Serum**: Serum is the liquid portion of blood obtained after clotting and centrifugation. It is commonly collected for serological testing to detect antibodies against specific pathogens. Serum samples can help determine whether a bird has been exposed to a particular pathogen and has mounted an immune response.
- **Cloacal or fecal swabs**: Cloacal or fecal swabs are commonly collected to detect and isolate enteric pathogens, such as Salmonella or avian influenza viruses. These swabs are used to sample the cloaca or the bird's droppings, which may contain the infectious agents.
- **Tracheal or nasal swabs**: Tracheal or nasal swabs are collected to detect respiratory pathogens, such as avian influenza viruses, Newcastle disease virus, or infectious bronchitis virus. These swabs are used to sample the respiratory tract and may help identify the presence of the pathogens.
- **Tissue samples**: Tissue samples can be collected from various organs, depending on the suspected disease. For example, samples may be collected from the liver, spleen, lung, or trachea. These samples can be used for histopathological examination, PCR testing, or viral isolation to identify the causative agent.



Figure 5 Sampling techniques from poultry

Self-Check – 2	

Name_____ ID_____signature_____ date_____

Directions: Answer all the questions up on the instruction

Part I: Multiple choice (2 pt each)

1. Which one of the is not the hazards in poultry industry:
   A. Zoonoses
   B. Chemical uses
   C. Biological hazardous waste and sharps disposal
   D. Handling of chemicals and medicines
2. Which one is not an important consideration for hygiene in poultry feeding and watering
   A. Clean and Sanitary Feeders and Waterers
   B. Regular Inspection
   C. Proper Placement of weak stock
   D. Adequate Space
3. All are explaining avian influenza clinical signs expects:
   A. Decreased egg production and/or soft-shelled or misshapen eggs
   B. Swelling of the head, eyelids, comb, wattles, and legs
   C. Purple discoloration of the wattles and combs
   D. Good coordination
4. All are explaining Marek's clinical signs expects:
   A. paralysis or weakness of the legs, wings, and neck
   B. Weight loss
   C. Depression
   D. None
5. Which one called as white diarrhea in poultry bacteria disease
   A. Infectious coryza
   B. Pullorum disease
   C. Salmonellosis
   D. Fowl cholera
   E. All

Part II: Short Answer Questions (2pts each)

1. Describe and discuss the main hazard occurred in poultry industry?

2. List the main poultry feeding and watering equipment's and it's uses?
3. Describe and explain the main two bacterial, viral, protozoa and parasite of poultry diseases
4. What is poultry public health and its economic diseases?

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

LG #32 LO3 # Identify and handle non-infectious causes of poultry diseases

Instruction sheet

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

- Production loss associated to poor management practices.
- Identification of nutritional deficiency.
- The source of poisoning and toxicity.
- Causes of stress that induce poor production and productivity.
- Prevention and control methods of non-infectious poultry diseases

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:

- Assess and identify poor management practices which result in production loss
- Identify and manage nutritional deficiency due to improper ration composition.
- Identify poisoning and sources of toxicity.
- Identify and manage stress due to over stocking, production, vaccination, treatment and climate change.
- Advice and give economic importance of the diseases.

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. Production loss associated to poor management practices

i. Environmental Stressors: Extreme temperatures, high humidity, poor ventilation, and inadequate lighting can all contribute to environmental stress in poultry. Heat stress, in particular, can lead to reduced feed intake, decreased growth rates, impaired egg production, and increased mortality. Similarly, cold stress can negatively impact poultry performance. Additionally, exposure to excessive noise, vibrations, or other physical disturbances can cause stress and disrupt normal behavior and physiological functions.

ii. Disease and Infections: Infectious diseases, such as avian influenza, Newcastle disease, infectious bronchitis, coccidiosis, and bacterial or viral infections, can significantly impact poultry health and productivity. Disease outbreaks increase stress levels in birds and lead to decreased appetite, impaired immune function, reduced growth rates, increased mortality, and lower egg production. The management and treatment of diseases require additional resources and can further exacerbate stress.

iii. Poor Nutrition and Feed Quality: Inadequate or imbalanced nutrition can lead to stress and negatively affect poultry production. Poor-quality feed, feed shortages, or incorrect formulation can result in nutrient deficiencies or excesses, compromising bird health and performance. Insufficient access to clean water, mineral imbalances, and mycotoxin contamination in feed can also contribute to stress and decreased productivity.

iv. Overcrowding and Space Limitations: Overcrowding in poultry houses or insufficient space per bird can induce stress. Birds may experience increased competition for resources, restricted movement, and increased exposure to pathogens. Overcrowding can lead to social stress, aggression, feather pecking, cannibalism, and compromised welfare, all of which can negatively impact production and productivity.

v. Handling and Management Practices: Improper handling, rough transportation, inadequate handling facilities, or stressful management practices can trigger stress responses in poultry. Frequent disturbances, sudden movements, or improper catching and handling

techniques can cause fear, panic, and physical injuries, leading to reduced productivity and increased mortality rates.

vi. Changes in Routine and Environment: Poultry are sensitive to changes in their routine and environment. Any sudden changes in lighting, feeding schedules, water availability, or housing conditions can induce stress responses. Relocation or introduction of new birds to an existing flock can also disrupt social dynamics and lead to stress-related issues.

vii. Social Stress and Pecking Order: Poultry are social animals with established hierarchies and pecking orders. Introducing new birds, changing flock compositions, or overcrowding can disrupt the social balance and increase social stress. Aggression, feather pecking, cannibalism, and other detrimental behaviors can arise from social stress, causing injuries, reduced growth, and compromised welfare.

viii. Transport and Handling during Marketing: Transporting poultry to market or processing facilities can be stressful for birds. Long travel times, overcrowded transportation crates, rough handling, and exposure to unfamiliar environments and noises can induce stress and negatively impact bird health and meat quality.

To mitigate the negative effects of stress on production and productivity in poultry, it is crucial to implement appropriate management practices. These may include providing optimal environmental conditions, maintaining good biosecurity, ensuring proper nutrition and feed quality, implementing effective disease prevention and control measures, optimizing flock density, and using appropriate handling techniques during management and marketing. Regular monitoring, early detection of stress-related issues, and prompt intervention are essential to minimize the impact of stress on poultry well-being and performance.

3.2. Identification of nutritional deficiency

A. Articular gout/visceral gout

Visceral gout – often after rapidly progressing renal failure (less common)Articular goat – due to long term increases in serum uric acid; risk factors include excess dietary calcium, high protein diet, Vit A deficiency, water deprivation/dehydration, high cholesterol diet, mycotoxins.

Signs

- Depression
- Intake
- Lameness
- Enteritis
- Reduced food
- Ruffled feathers
- Moist vent (non -specific)

Diagnosis

- Post Mortem Examination.
- Analysis of feed (esp. if backyard Poultry).

Post Mortem Examination.

- Dry white lesions within the joint- white chalky needle shaped shiny crystals (‘tophi’)- especially feet!

Differential diagnosis

- Other causes of lameness e.g., infectious arthritis, rickets, fracture, ruptured gastrocnemius, limb deformities.

Treatment

- Supply dietary calcium, low protein diet, Vit A, watering, cholesterol diet, mycotoxins.

B. Rickets

Etiology

- Vitamin D3 deficiency or calcium/phosphorous imbalance (inadequate bone mineralization) most common in young rapidly growing birds (broilers).

Signs

- Lameness (~10-14) Soft bines and beak, hock swelling, flat and beaded rib cage, poor growth, reduced BW.

PME (Histopathology)

Hypocalcemia

- Accumulation of proliferating chondrocytes
  - ✓ widened proliferation zone of cartilage **Hypophosphatemia.**
- Accumulation of hypertrophic chondrocytes
  - ✓ widened hypertrophic zone of **cartilage.**

Differential diagnosis

- All growth plates affected, evenly thickened growth plates- accumulation of non-mineralized cartilage (cf. tibial dyschondroplasia) Soft, rubbery bones; enlarged epiphyses, beading and fracture of ribs.

Post mortem examination

- Tibial dyschondroplasia and Arthritis

Treatment

- Vitamin D – 25 (OH)D liver function compromised or young bird e.g. 'HyD'- Vitamin D3 (oral supplement) if older a healthy Dietary changes to adequate Ca/P.

C. Mineral deficiency

Mineral deficiencies in poultry can have significant impacts on their overall health, growth, and productivity. Here are some common mineral deficiencies that can occur in poultry:

- Calcium (Ca) deficiency: Calcium is crucial for the formation of strong bones, eggshell development, and proper muscle and nerve function. Calcium deficiency can lead to weak bones, poor egg quality, increased incidence of eggshell abnormalities, and reduced egg production.
- Phosphorus (P) deficiency: Phosphorus works in conjunction with calcium to maintain skeletal health and plays a vital role in energy metabolism, enzyme function, and acid-base balance. Phosphorus deficiency can result in poor growth, reduced feed efficiency, weak bones, decreased egg production, and poor eggshell quality.
- Sodium (Na) deficiency: Sodium is involved in maintaining proper electrolyte balance, acid-base regulation, and nerve impulse transmission. Sodium deficiency can lead to reduced growth, decreased feed intake, dehydration, decreased egg production, and poor feathering.
- Potassium (K) deficiency: Potassium is essential for maintaining proper muscle and nerve function, acid-base balance, and water balance within the body. Potassium deficiency can cause reduced growth, decreased feed efficiency, muscle weakness, decreased egg production, and impaired feathering.
- Iron (Fe) deficiency: Iron is necessary for the formation of hemoglobin, which carries oxygen in the blood. Iron deficiency can cause anemia, poor growth, reduced feed efficiency, pale comb and wattles, and decreased resistance to diseases.
- Zinc (Zn) deficiency: Zinc is involved in numerous enzyme systems and plays a critical role in growth, feathering, reproduction, and immune function. Zinc deficiency can result in poor growth, decreased feed efficiency, delayed sexual maturation, poor feathering, reduced egg production, and impaired immune function.
- Copper (Cu) deficiency: Copper is essential for several enzymatic reactions, including iron metabolism and connective tissue formation. Copper deficiency can lead to poor growth, anemia, reduced pigmentation, skeletal abnormalities, and impaired immune function.
- Manganese (Mn) deficiency: Manganese is necessary for proper skeletal development, carbohydrate and lipid metabolism, and reproductive performance. Manganese deficiency

can cause reduced growth, impaired bone development, skeletal deformities, reduced egg production, and poor eggshell quality.

D. Protein Deficiency

Protein deficiency in poultry can have significant negative effects on their growth, development, and overall health. Proteins are essential for various biological processes in poultry, including muscle development, feathering, enzyme production, immune function, and egg production. Here are some consequences of protein deficiency in poultry:

- Slow growth and poor weight gain: Protein is the primary building block for muscle development. A deficiency in protein can lead to stunted growth and inadequate weight gain in poultry. Birds may appear thin and underdeveloped compared to their healthy counterparts.
- Reduced feathering: Proteins are crucial for proper feather development and maintenance. Protein deficiency can result in poor feather quality, including thin, weak, or missing feathers. This can negatively impact the bird's ability to regulate body temperature, leading to heat stress or increased susceptibility to cold weather.
- Decreased egg production: Protein deficiency can disrupt the hormonal balance in laying hens, leading to reduced egg production. It can also result in poor egg quality, including thin-shelled or misshapen eggs.
- Immune system impairment: Proteins play a vital role in the production of antibodies and other immune system components. Insufficient protein intake can weaken the bird's immune system, making them more susceptible to infections and diseases.
- Poor reproductive performance: Protein deficiency can affect the reproductive performance of poultry. In males, it can lead to reduced sperm production and fertility. In females, it can cause irregular or decreased egg production and compromised hatchability.

F. **Vitamin deficiencies**

Vitamin deficiencies in poultry, including deficiencies in vitamins A, D, E, K, B1, and B2, can have detrimental effects on their health, growth, and productivity. Here's an overview of the consequences of these specific vitamin deficiencies:

- Vitamin A (retinol) deficiency: Vitamin A is important for vision, growth, reproduction, and immune function. In poultry, vitamin A deficiency can lead to poor growth, reduced feed efficiency, eye abnormalities, decreased egg production, reduced hatchability, respiratory issues, and increased susceptibility to infections.
- Vitamin D (calciferol) deficiency: Vitamin D is crucial for calcium and phosphorus absorption, bone development, and overall skeletal health. In poultry, vitamin D deficiency can result in reduced growth, weak and deformed bones, decreased egg production, poor eggshell quality, and an increased risk of leg disorders like rickets.
- Vitamin E (tocopherol) deficiency: Vitamin E is an antioxidant that protects cells from oxidative damage and supports immune function. In poultry, vitamin E deficiency can lead to muscular dystrophy, poor muscle development, reduced fertility, weak immune response, and increased susceptibility to diseases.
- Vitamin K (phylloquinone) deficiency: Vitamin K is involved in blood clotting and bone metabolism. In poultry, vitamin K deficiency can cause poor blood clotting, leading to hemorrhages and increased mortality. It can also result in reduced bone strength and deformities.
- Vitamin B1 (thiamine) deficiency: Thiamine is important for carbohydrate metabolism and nerve function. In poultry, vitamin B1 deficiency can lead to poor growth, reduced appetite, nervous disorders, curled toes, and paralysis.
- Vitamin B2 (riboflavin) deficiency: Riboflavin is essential for energy metabolism, growth, and feather development. In poultry, vitamin B2 deficiency can result in reduced growth, poor feathering, eye abnormalities, reduced egg production, and poor hatchability.

F. Energy deficiency

Energy deficiency in poultry occurs when the birds' dietary energy intake is insufficient to meet their energy requirements. Energy is a critical nutrient for poultry as it fuels various physiological processes, including growth, maintenance, egg production, and physical activity. Here are some consequences of energy deficiency in poultry:

i. Slow growth and reduced weight gain: Insufficient energy intake can lead to slow growth and inadequate weight gain in poultry. Birds may appear smaller and underdeveloped compared to healthy counterparts of the same age.
ii. Reduced egg production: Energy deficiency can negatively impact the reproductive performance of laying hens, leading to a decrease in egg production. Hens may lay fewer eggs, have longer intervals between egg-laying, or experience early cessation of egg production.
iii. Poor feed efficiency: Energy-deficient birds may have reduced feed efficiency, meaning they require more feed to produce a unit of body weight or eggs. This inefficiency can lead to increased feed costs and reduced profitability for poultry farmers.
iv. Decreased activity and lethargy: Energy is essential for physical activity and normal behavior in poultry. When birds suffer from energy deficiency, they may exhibit reduced activity levels, decreased foraging behavior, and general lethargy.
v. Weakened immune system: Energy plays a crucial role in supporting immune function. Poultry with energy deficiency may have a weakened immune system, making them more susceptible to infections and diseases.
vi. Poor feathering: Energy deficiency can adversely affect feather quality and development. Birds may exhibit poor feather growth, abnormal feathering patterns, or feather loss. This can impact their ability to regulate body temperature and increase vulnerability to environmental stressors.

3.3. The source of poisoning and toxicity

Poisoning and toxicity in poultry can occur when birds are exposed to harmful substances or toxins, either through ingestion, inhalation, or contact with contaminated environments or feed. The sources of posing and toxicity in poultry farm are aflatoxins, salts, ammonia, lead, plants, botulism, pesticides and etc.

A. Aflatoxins

Aflatoxins are toxic compounds produced by certain strains of fungi, primarily Aspergillus flavus and Aspergillus parasiticus. These fungi can contaminate various agricultural commodities, including grains, nuts, and oilseeds. Aflatoxins are a significant concern in poultry production as they can have detrimental effects on bird health and performance. Here's some information about aflatoxins in poultry:

- Sources of Aflatoxin Contamination: Aflatoxins can contaminate poultry feed through various routes:
- Pre-harvest contamination: Fungi can infect crops in the field, especially under conditions of high temperature, humidity, and drought stress.
- Post-harvest contamination: Improper drying, storage, or handling of grains and feed ingredients can encourage fungal growth and aflatoxin production.
- Contaminated ingredients: Feed ingredients, such as corn, peanuts, cottonseed meal, and other oilseeds, are particularly susceptible to aflatoxin contamination.

Adverse Effects aflatoxins on Poultry:

- Reduced growth and feed efficiency: Aflatoxin consumption can lead to reduced weight gain and impaired feed conversion efficiency in poultry.
- Immunosuppression: Aflatoxins can suppress the immune system, making birds more susceptible to infections and diseases.
- Organ damage: Aflatoxins primarily affect the liver, causing hepatotoxicity and potentially leading to liver damage or failure.
- Poor egg production and quality: Laying hens exposed to aflatoxins may experience reduced egg production, smaller egg size, and poor shell quality.

Regulatory Limits and Monitoring:

- Many countries have established regulatory limits for aflatoxin levels in poultry feed to ensure the safety of animal products and human health.
- Regular monitoring and testing of feed ingredients and finished feed for aflatoxin levels are critical to detect contamination and prevent exposure to unsafe levels.

Prevention and Control Strategies:

- Good agricultural practices: Implementing proper crop management techniques, such as timely harvesting, drying, and storage, can help minimize pre-harvest aflatoxin contamination.
- Quality control of feed ingredients: Source feed ingredients from reputable suppliers and conduct regular testing for aflatoxin levels.
- Mycotoxin binders: The inclusion of mycotoxin binders in feed formulations can help adsorb aflatoxins and reduce their absorption in the digestive system of birds.
- Feed management: Avoid using heavily contaminated feed ingredients and practice proper feed storage and handling to minimize post-harvest fungal growth.

Veterinary Support:

- Consult with a veterinarian or nutritionist experienced in poultry health and mycotoxin management to develop appropriate strategies for prevention, monitoring, and control of aflatoxin contamination.
- If aflatoxicosis is suspected, seek veterinary assistance for diagnosis, supportive treatment, and management recommendations.

B. Salt poising and toxicity in poultry

Salt poisoning, also known as salt toxicity or hypernatremia, can occur in poultry when they consume excessive amounts of salt or have access to water with high salt concentrations. Here's some information about salt poisoning and toxicity in poultry:

i. **Salt Sources:** Poultry can be exposed to excessive salt through various sources, including:
   - Feed and supplements: Certain feed formulations or supplements may contain high levels of sodium chloride (table salt) or other salt sources.
   - Water sources: Poultry drinking water with high salt content, such as saline or brackish water, can lead to salt poisoning.
   - Environmental exposure: Poultry may have access to salt licks, salt blocks, or other salt-containing materials in their environment.

ii. Effects of Salt Poisoning:

- Dehydration: Excessive salt intake can cause dehydration in poultry due to its osmotic effect, drawing water out of the cells.
- Electrolyte imbalance: High salt levels disrupt the balance of electrolytes in the body, affecting normal physiological functions.
- Reduced feed intake: Birds with salt toxicity may eat less due to increased thirst and discomfort, leading to reduced growth and productivity.
- Kidney damage: Prolonged exposure to high salt levels can strain the kidneys and potentially cause renal damage.

iii. Symptoms of Salt Poisoning:

- Increased thirst and water consumption
- Excessive urination
- Lethargy and weakness
- Reduced appetite
- Weight loss
- Diarrhea
- Tremors or convulsions (in severe cases)

iv. Prevention and Management:

- Water management: Ensure poultry have access to clean, fresh water with low salt content. Regularly test water sources to monitor salt levels.
- Feed formulation: Use balanced and appropriate feed formulations that meet the specific nutritional requirements of poultry without excessive salt content.
- Environmental control: Prevent access to salt licks, blocks, or other salt-containing materials that may be present in the poultry environment.
- Monitoring and observation: Regularly monitor poultry behavior, feed intake, water consumption, and growth performance to detect any signs of salt toxicity.
- Veterinary assistance: If salt poisoning is suspected, consult a veterinarian for diagnosis, supportive care, and appropriate treatment options.

C. Ammonia poising and toxicity

Ammonia poisoning and toxicity can be a significant concern in poultry production, particularly in confined or poorly ventilated housing systems. Ammonia (NH3) is a gas that is released from poultry waste, primarily from the breakdown of uric acid in manure. Here's some information about ammonia poisoning and toxicity in poultry:

- **Sources of Ammonia:**
  - ✓ Accumulated manure: Ammonia is produced as a result of bacterial decomposition of uric acid in manure. Poor manure management and inadequate ventilation can lead to high ammonia levels in poultry houses.
  - ✓ High nitrogen diets: Feeding diets high in crude protein or certain protein sources can increase nitrogen excretion in the urine, resulting in higher ammonia production.
- **Effects of Ammonia Poisoning:**
  - ✓ Respiratory irritation: Ammonia is highly irritating to the respiratory system of poultry. Prolonged exposure to high ammonia levels can cause inflammation of the respiratory tract, leading to respiratory distress and reduced lung function.
  - ✓ Reduced growth and performance: Chronic exposure to elevated ammonia levels can result in reduced growth rates, decreased feed efficiency, and impaired overall performance.
  - ✓ Immune suppression: Ammonia toxicity can weaken the immune system of poultry, making them more susceptible to respiratory infections and other diseases.
  - ✓ Eye and mucous membrane damage: Ammonia can cause irritation and damage to the eyes, nasal passages, and other mucous membranes of poultry.
- **Symptoms of Ammonia Poisoning:**
  - ✓ Coughing, wheezing, or sneezing
  - ✓ Watery eyes or excessive tearing
  - ✓ Nasal discharge
  - ✓ Labored or rapid breathing
  - ✓ Reduced feed intake and weight gain
  - ✓ Poor feather quality
  - ✓ Increased susceptibility to respiratory infections
- **Prevention and Management:**

- Proper ventilation: Ensure adequate ventilation in poultry housing to remove ammonia and maintain optimal air quality. Properly designed ventilation systems should provide fresh air while removing stale air and ammonia.
- Manure management: Implement effective manure management practices, including regular removal of accumulated manure, proper storage, and appropriate use of litter materials.
- Monitoring ammonia levels: Regularly measure ammonia levels in poultry houses using appropriate gas monitoring devices. This helps identify areas with high ammonia concentrations and facilitates corrective actions.
- Nutritional considerations: Optimize dietary protein levels to minimize nitrogen excretion and ammonia production. Work with a poultry nutritionist to formulate balanced diets.
- Hygiene and biosecurity: Maintain good hygiene practices to minimize ammonia production from decomposing organic matter and reduce the risk of respiratory infections.

D. Lead poising and toxicity

Lead poisoning and toxicity can occur in poultry when they are exposed to lead-containing substances or environments. Lead is a toxic heavy metal that can have detrimental effects on the

health and well-being of birds. Here's some information about lead poisoning and toxicity in poultry:

i. Sources of Lead Exposure:
   - Contaminated soil: Poultry may be exposed to lead through ingestion of soil contaminated with lead-based paint, industrial waste, or other sources of lead contamination.
   - Water contamination: Lead can leach into water from plumbing materials, pipes, or contaminated water sources, leading to exposure if poultry drink or bathe in the contaminated water.
   - Feed contamination: Poultry feed can become contaminated with lead if it is stored or transported in lead-containing containers or if it comes into contact with lead dust or particles.
   - Environmental exposure: Poultry housed in areas with lead-based paint, lead batteries, lead pipes, or other lead-containing materials may have increased exposure risks.

ii. Effects of Lead Poisoning:
   - Neurological damage: Lead toxicity affects the central nervous system, leading to neurological symptoms such as seizures, tremors, paralysis, and impaired motor function.
   - Gastrointestinal issues: Ingested lead can irritate the gastrointestinal tract, causing symptoms like vomiting, diarrhea, abdominal pain, and reduced feed intake.
   - Anemia: Lead poisoning can interfere with the production of red blood cells, leading to anemia and related symptoms such as weakness, lethargy, and pale mucous membranes.
   - Reproductive issues: Lead toxicity can impact fertility and hatchability in breeding poultry, leading to reduced reproductive performance.

iii. Symptoms of Lead Poisoning:
   - Neurological signs: Seizures, head shaking, tremors, uncoordinated movements, paralysis.
   - Gastrointestinal signs: Vomiting, diarrhea, loss of appetite, weight loss.
   - Respiratory signs: Difficulty breathing, coughing.

- Anemia-related signs: Weakness, lethargy, pale mucous membranes.
- Reproductive issues: Decreased fertility, poor hatch rates.

iv. Prevention and Management:

- Source identification and removal: Identify and eliminate potential sources of lead contamination in the poultry environment, such as lead-based paint, batteries, or contaminated soil.
- Water quality control: Regularly test water sources for lead content and provide clean, uncontaminated water to poultry.
- Feed management: Ensure that feed is stored and transported in lead-free containers and minimize the risk of lead contamination during handling.
- Environmental control: Keep poultry away from areas with potential lead exposure and provide a clean and safe housing environment.
- Veterinary assistance: If lead poisoning is suspected, seek immediate veterinary assistance for diagnosis, treatment, and supportive care.

E. Plants poising and toxicity

Plants can pose a risk of poisoning and toxicity to poultry if they consume certain toxic plant species or parts of plants. Poultry are generally more resistant to plant toxicities compared to other livestock species, but there are still plants that can be harmful to them. It's important to be aware of potentially toxic plants and take necessary precautions. Here's some information about plant poisoning and toxicity in poultry:

i. Toxic Plant Species: There are several plant species that contain toxic compounds that can be harmful to poultry. Some common examples include:

- Nightshade family: Plants such as deadly nightshade (Atropa belladonna), black nightshade (Solanum nigrum), and horsenettle (Solanum carolinense) can contain toxic alkaloids.
- Lily family: Certain lilies, such as Easter lily (Lilium spp.) and daylily (Hemerocallis spp.), can be toxic to poultry, particularly to their kidneys.
- Azalea and Rhododendron: These ornamental plants contain grayanotoxins, which can affect the cardiovascular and nervous systems of poultry.

- Yew: The yew plant (Taxus spp.) contains toxic alkaloids that can be lethal to poultry if ingested.
- Oleander: Oleander (Nerium oleander) is a highly toxic plant to poultry, containing cardiac glycosides that can lead to severe cardiac issues.

ii. Symptoms of Plant Poisoning:

- Digestive issues: Diarrhea, vomiting, abdominal pain, loss of appetite.
- Neurological signs: Weakness, tremors, seizures, ataxia (loss of coordination), paralysis.
- Respiratory distress: Difficulty breathing, coughing.
- Cardiovascular effects: Irregular heartbeat, abnormal blood pressure.
- Kidney damage: Increased thirst, excessive urination, changes in urine color.

6. Prevention and Management:

- Identification: Familiarize yourself with the toxic plants that are prevalent in your area and on your property. Be able to identify them and remove them from poultry access areas.
- Fencing and confinement: Create barriers or enclosures to prevent poultry access to areas with known toxic plants.
- Pasture management: Regularly inspect pastures and grazing areas to ensure they are free of toxic plants. Remove any toxic plants promptly.
- Education and awareness: Educate yourself and others involved in poultry management about toxic plants and their potential risks.
- Veterinary guidance: Consult a veterinarian if you suspect plant poisoning in your poultry. They can provide appropriate treatment and advice.



Fig 6a: Nightshade (Atropa belladonna)



Fig 6b: black nightshade (Solanum nigrum)





Fig 6c: Horsenettle (Solanum carolinense)

F. Botulism poising and toxicity

Botulism poisoning is a serious condition caused by the ingestion of toxins produced by the bacterium Clostridium *botulinum*. It can affect poultry, including chickens, turkeys, and ducks. Here's some information about botulism poisoning and toxicity in poultry:

i. Sources of Botulism Toxins:

- Contaminated feed or water: Poultry can be exposed to botulism toxins if their feed or water becomes contaminated with decaying organic matter or carcasses of animals infected with Clostridium botulinum.
- Environmental exposure: Poultry may ingest the bacteria or toxins from contaminated soil, litter, or vegetation in their environment.

- Improperly processed feed: If feed ingredients or complete feed are not properly processed or stored, it can create conditions for Clostridium botulinum growth and toxin production.

ii. Effects of Botulism Poisoning:

- Muscle paralysis: Botulinum toxins interfere with nerve function, leading to progressive muscle weakness and paralysis. Poultry may experience difficulty walking, wing drooping, and inability to hold their head up.
- Respiratory distress: Paralysis of respiratory muscles can result in breathing difficulties and respiratory distress.
- Decreased feed intake: Affected birds may have reduced appetite and difficulty swallowing due to muscle weakness.
- General weakness: Poultry with botulism poisoning may appear lethargic, exhibit decreased activity, and have a general lack of energy.

iii. Symptoms of Botulism Poisoning:

- Progressive muscle weakness
- Inability to stand or walk properly
- Wing drooping or paralysis
- Respiratory difficulty
- Decreased feed intake
- Lethargy and weakness

iv. Prevention and Management:

- Proper feed storage and handling: Ensure that feed ingredients and complete feed are properly processed, stored, and protected from contamination by decaying organic matter or carcasses.
- Clean water sources: Provide clean and fresh water to poultry, free from decaying organic material or potential sources of contamination.
- Removal of carcasses: Promptly remove and properly dispose of any dead animals, including poultry, from the premises to prevent the growth and spread of Clostridium botulinum.
- Environmental management: Maintain clean and well-drained poultry housing and grazing areas, minimizing the presence of decaying organic matter.
- Veterinary assistance: If botulism poisoning is suspected, contact a veterinarian immediately for diagnosis, treatment, and supportive care.

G. Pesticide poising and toxicity

Pesticide poisoning and toxicity can occur in poultry when they are exposed to pesticides, either through direct contact or ingestion. Poultry can be particularly susceptible to the toxic effects of pesticides due to their small size and high metabolic rate. Here's some information about pesticide poisoning and toxicity in poultry:

- Sources of Pesticide Exposure:
  - ✓ Direct contact: Poultry can come into contact with pesticides through direct exposure to treated surfaces, such as floors, walls, or vegetation.
  - ✓ Contaminated feed or water: Pesticide residues in feed or water sources can lead to ingestion and subsequent toxicity in poultry.
  - ✓ Drift or spray exposure: Poultry housed near agricultural fields may be exposed to pesticides through airborne drift or spray application.
- Types of Pesticides:
  - ✓ Organophosphates (OPs) and Carbamates: These pesticides inhibit the activity of the enzyme acetylcholinesterase, leading to an accumulation of acetylcholine in the nervous system. Symptoms of OP and carbamate poisoning can include muscle tremors, salivation, respiratory distress, and paralysis.
  - ✓ Pyrethroids: These pesticides affect the nervous system by disrupting nerve cell membranes. Symptoms of pyrethroid poisoning in poultry can include tremors, uncoordinated movements, and convulsions.
  - ✓ Herbicides and Fungicides: Some herbicides and fungicides can also be toxic to poultry if ingested in significant quantities. The specific symptoms and effects depend on the type of pesticide.
- Symptoms of Pesticide Poisoning:
  - ✓ Neurological signs: Tremors, convulsions, muscle weakness, ataxia (loss of coordination), paralysis.
  - ✓ Respiratory distress: Difficulty breathing, rapid or labored breathing.
  - ✓ Gastrointestinal issues: Vomiting, diarrhea, loss of appetite.
  - ✓ Skin and eye irritation: Redness, swelling, excessive tearing.
- Prevention and Management:

- ✓ Proper pesticide use: Follow label instructions carefully when applying pesticides and ensure that poultry are not exposed to treated areas during application or until the recommended re-entry period has passed.
- ✓ Pesticide storage: Store pesticides securely and away from poultry housing and feed storage areas to prevent accidental exposure.
- ✓ Water and feed quality control: Regularly test water and feed sources for pesticide residues and ensure they are free from contamination.
- ✓ Environmental management: Maintain a clean and well-maintained poultry housing environment, minimizing exposure to potentially contaminated surfaces or vegetation.
- ✓ Veterinary assistance: If pesticide poisoning is suspected, seek immediate veterinary attention for diagnosis, treatment, and supportive care.

H. Anticoagulant Rodenticide Poisoning

Anticoagulant rodenticides are commonly used to control rodent populations, but they can pose a significant risk of poisoning to poultry and other non-target animals. These rodenticides work by interfering with blood clotting mechanisms, leading to bleeding disorders. Poultry may be exposed to anticoagulant rodenticides through the consumption of contaminated bait or poisoned rodents. Here's some information about anticoagulant rodenticide poisoning in poultry:

- Types of Anticoagulant Rodenticides:
  - ✓ First-generation anticoagulants: These include coumatetralyl, warfarin, and chlorophacinone.
  - ✓ Second-generation anticoagulants: These are more potent and include brodifacoum, bromadiolone, difenacoum, and difethialone.
- Sources of Exposure:
  - ✓ Bait ingestion: Poultry may directly consume bait pellets or blocks containing anticoagulant rodenticides.
  - ✓ Secondary poisoning: Poultry can be exposed to anticoagulant rodenticides by consuming rodents that have ingested the baits.
- Effects of Anticoagulant Rodenticide Poisoning:

- ✓ Bleeding disorders: Anticoagulant rodenticides interfere with the blood's ability to clot, leading to uncontrolled bleeding. Poultry may experience internal bleeding, external bleeding from cuts or wounds, and bleeding from body orifices.
- ✓ Anemia: Chronic bleeding can lead to anemia, resulting in weakness, lethargy, pale mucous membranes, and reduced egg production.
- ✓ Organ damage: Prolonged exposure to anticoagulant rodenticides can cause damage to internal organs, such as the liver and kidneys.

- Symptoms of Anticoagulant Rodenticide Poisoning:
  - ✓ Unexplained bleeding: Blood in feces, bloody nasal discharge, bleeding from the mouth or vent, bruising, or hemorrhages.
  - ✓ Weakness and lethargy: Poultry may appear weak, tired, and have a decreased activity level.
  - ✓ Pale mucous membranes: The gums and other mucous membranes may appear pale due to anemia.
  - ✓ Reduced egg production: Affected hens may show a decrease in egg laying.
- Prevention and Management:
  - Integrated pest management: Implement effective rodent control strategies that minimize the need for rodenticides.
  - Bait placement: Ensure that bait stations or baits are inaccessible to poultry and other non-target animals.
  - Monitoring and removal of poisoned rodents: Regularly check for and remove dead or dying rodents to prevent secondary poisoning
  - Safety precautions: Follow label instructions when using anticoagulant rodenticides and handle them with caution.
  - Veterinary assistance: If anticoagulant rodenticide poisoning is suspected, seek immediate veterinary attention for diagnosis, treatment, and supportive care.

In general, poultry, non-infectious diseases poisoning and toxicity can occur due to various sources, including chemicals, plants, feed contaminants, and environmental factors. Here are some common sources of poisoning and toxicity in poultry:

a. **Chemicals and Pesticides**: Exposure to chemicals and pesticides can be toxic to poultry. This includes insecticides, herbicides, rodenticides, disinfectants, and cleaning agents. Accidental ingestion or exposure to these substances can lead to poisoning.
b. **Plant Toxicity**: Certain plants and vegetation can be toxic to poultry if ingested. Examples include poisonous weeds, ornamental plants, and certain fruits or vegetables. Plants such as nightshade, oleander, yew, and certain mushrooms are known to be toxic to poultry.
c. **Feed Contaminants**: Contaminated or improperly formulated feed can lead to poisoning in poultry. This includes molds, mycotoxins (produced by fungi), excessive levels of certain minerals or vitamins, and contamination with chemicals or medications.
d. **Heavy Metals**: Exposure to heavy metals such as lead, mercury, arsenic, and zinc can be toxic to poultry. These metals can be present in the environment, water sources, or feed, especially if contaminated.
e. **Medications and Drugs**: Incorrect use or administration of medications, antibiotics, or other drugs can result in toxicity in poultry. Overdosing, using expired drugs, or using medications not approved for poultry can have adverse effects.
f. **Water Contamination**: Poor-quality water or water contaminated with chemicals, heavy metals, or toxins can lead to poisoning in poultry. This includes water sources contaminated with agricultural runoff, industrial waste, or polluted water bodies.
g. **Environmental Toxins**: Poultry can be exposed to environmental toxins such as gases, fumes, or pollutants. Examples include carbon monoxide, ammonia, pesticides sprayed in nearby fields, or exhaust fumes from machinery or vehicles.
h. **Rodenticides and Baits:** The use of rodenticides and baits to control rodents can also pose a risk to poultry. Secondary poisoning can occur if poultry consume rodents that have ingested these toxic substances.

Preventing poisoning and toxicity in poultry involves several measures, including:

2. Proper storage and handling of chemicals, pesticides, and medications.
3. Providing clean and uncontaminated water sources.
4. Identifying and removing toxic plants from the poultry environment.
5. Regularly inspecting and monitoring feed for contaminants.
6. Following appropriate medication and drug administration protocols.
7. Ensuring a clean and safe environment for poultry, minimizing exposure to environmental toxins.

3.4. Causes of stress that induce poor production and productivity

Stress can have a significant impact on poultry production and productivity. When poultry experience stress, their overall well-being, health, and performance can be compromised. Here are some common causes of stress in poultry that can lead to poor production and reduced productivity:

- Environmental Factors: Extreme temperatures (heat or cold stress), inadequate ventilation, poor lighting conditions, and high noise levels can all be sources of stress for poultry. These factors disrupt the birds' comfort, hinder their ability to thermoregulate, and may lead to reduced feed intake, decreased growth, and decreased egg production.
- Handling and Management Practices: Improper handling, rough treatment, overcrowding, and inconsistent management practices can cause stress in poultry. Frequent disturbances, aggressive interactions, and excessive human contact can disrupt the birds' routine and create an environment of fear and stress
- Disease and Infection: Infectious diseases such as respiratory infections, bacterial or viral diseases, and parasitic infestations can cause significant stress in poultry. The immune response to these diseases consumes energy and resources, diverting them away from growth and production. Additionally, quarantine measures, vaccinations, or treatments can also cause temporary stress.
- Social Hierarchy and Pecking Order: Poultry, especially chickens, establish a social hierarchy within their flock. Aggressive pecking, bullying, and the establishment of

dominance can lead to stress, injuries, and reduced productivity, particularly in lower-ranking birds that experience constant harassment.

- Nutritional Imbalances: Inadequate or imbalanced nutrition can be a source of stress for poultry. Nutritional deficiencies or excesses can compromise their health, weaken the immune system, and negatively impact growth, egg production, and overall productivity.
- Transportation and Handling during Shipping: The process of transporting poultry, especially over long distances, can be highly stressful. Exposure to unfamiliar environments, vibrations, temperature fluctuations, and handling during shipping can lead to stress, which may result in reduced production and compromised health.
- Changes in Routine or Environment: Any sudden changes in the birds' routine, such as changes in feed, water, lighting, or housing conditions, can induce stress. Moving birds to new locations, introducing new flock members, or making significant alterations to their environment can disrupt their comfort and familiarity, leading to stress-related issues.
- Predation and Fear: Poultry are prey animals and are naturally sensitive to perceived threats. Frequent exposure to predators, loud noises, or other fear-inducing stimuli can trigger stress responses, affecting their behavior, feeding patterns, and overall productivity.

To **minimize** the impact of stress on poultry production and productivity, it is important to implement the following measures:

- Provide optimal environmental conditions, including appropriate temperature, ventilation, lighting, and noise control.
- Ensure proper flock management practices, such as avoiding overcrowding, implementing consistent handling techniques, and minimizing disruptions to the birds' routine.
- Implement effective biosecurity measures to prevent the introduction and spread of diseases.
- Provide a nutritionally balanced diet that meets the specific requirements of the birds.
- Minimize sudden changes in the birds' environment or routine, and introduce any changes gradually.
- Employ proper handling and transportation practices, ensuring the birds' comfort and safety during shipping.

- Create a predator-proof environment and minimize fear-inducing stimuli to reduce stress levels in poultry.

By addressing and minimizing these stressors, poultry producers can help maintain a healthier and more productive flock. Regular monitoring, observation, and collaboration with a veterinarian or poultry specialist can also aid in identifying and addressing potential stress-related issues in poultry.

3.5. Prevention and control methods of non-infectious

Preventing and controlling non-infectious diseases in poultry involves implementing various management practices and ensuring proper nutrition and environment for the birds. Here are some important prevention and control methods:

- **Balanced Nutrition**: Provide a well-balanced and nutritionally complete diet that meets the specific requirements of the poultry species and production stage. Proper nutrition supports the birds' immune system, overall health, and helps prevent nutritional deficiencies and metabolic disorders.
- **Quality Feed and Water**: Ensure that the feed and water provided to the poultry are of high quality and free from contaminants. Regularly test feed ingredients for mycotoxins and other potential toxins. Maintain clean water sources to prevent contamination and provide adequate hydration.
- **Biosecurity Measures**: Implement strict biosecurity protocols to prevent the introduction and spread of diseases, both infectious and non-infectious. This includes controlling access to the poultry facility, proper sanitation practices, and limiting exposure to potential sources of contamination.
- **Environmental Management**: Maintain a clean and well-ventilated environment for the poultry. Manage temperature, humidity, and ventilation to minimize stress and prevent respiratory issues. Proper waste management, including regular cleaning and disinfection of the poultry house, helps reduce the risk of disease transmission and toxic conditions.

- **Avoid Overcrowding**: Prevent overcrowding of poultry, as it can lead to stress, increased competition for resources, and the spread of diseases. Provide adequate space and ventilation to ensure the birds' well-being and minimize the risk of non-infectious diseases.
- **Vaccination and Immunization**: Although non-infectious diseases are not typically prevented by vaccination, routine vaccination against infectious diseases helps maintain the overall health and immune status of the birds. This makes them more resilient to non-infectious diseases and reduces the risk of secondary infections.
- **Monitoring and Early Detection**: Regularly monitor the birds for signs of illness, abnormal behavior, or changes in productivity. Early detection of non-infectious diseases allows for timely intervention and treatment, minimizing their impact on the flock.
- **Veterinary Care**: Establish a relationship with a poultry veterinarian who can provide guidance on disease prevention, conduct regular health check-ups, and offer advice on specific management practices for the prevention and control of non-infectious diseases.
- **Record Keeping and Analysis:** Maintain accurate records of flock health, including feed composition, vaccination schedules, and any observed health issues. Analyze the data to identify trends or patterns that may help identify potential risk factors for non-infectious diseases and guide preventive measures.
- **Education and Training:** Provide training to poultry caretakers and workers on proper management practices, disease prevention, and early detection. This ensures that everyone involved in poultry production is knowledgeable about best practices for maintaining a healthy flock.

By implementing these prevention and control methods, poultry producers can reduce the incidence and impact of non-infectious diseases, promote optimal bird health, and improve overall flock productivity and welfare.

Economic importance of non -infectious disease

Non-infectious diseases in poultry can have significant economic implications for the poultry industry. Here are some key economic impacts of non-infectious diseases in poultry:

- **Decreased Production:** Non-infectious diseases can lead to reduced productivity and decreased production in poultry. For example, skeletal disorders, such as leg deformities, can impair the mobility and growth of birds, resulting in reduced weight gain and lower meat production. Similarly, metabolic disorders or nutritional deficiencies can affect egg production and quality, leading to lower egg yields.
- **Increased Mortality**: Certain non-infectious diseases, such as heat stress or respiratory conditions, can increase mortality rates in poultry. This can result in financial losses due to the loss of birds and reduced overall flock size.
- **Treatment Costs**: Treating non-infectious diseases in poultry often requires veterinary intervention, medication, and specialized management practices. These treatments can incur additional costs for poultry producers, including the expense of purchasing medications, veterinary consultations, and labor associated with administering treatments.
- **Feed Efficiency and Nutritional Costs**: Non-infectious diseases can affect the feed efficiency of poultry, resulting in higher feed consumption per unit of production. This leads to increased feed costs for poultry producers. Additionally, certain diseases or conditions may require specialized diets or nutritional supplements, adding further expenses.
- **Downgrading or Rejection of Products**: In some cases, non-infectious diseases can lead to the downgrading or rejection of poultry products for human consumption. For example, conditions like dermatitis or feather pecking can result in skin lesions or feather loss, making the birds undesirable for sale. This can lead to financial losses for poultry producers who are unable to market their products at their full potential value.
- **Increased Management and Labor Costs**: Non-infectious diseases often require additional management practices, such as implementing environmental controls, improving housing conditions, or providing specialized care. These measures can increase labor and management costs for poultry producers.

- **Impact on Reputation and Marketability**: Persistent or widespread non-infectious diseases can have a negative impact on the reputation of poultry producers and the marketability of their products. Consumers are increasingly concerned about the health and welfare of animals, and diseases that affect poultry well-being can lead to a loss of consumer confidence and reduced demand for products.

Overall, non-infectious diseases in poultry can result in significant economic losses for the poultry industry, affecting production, mortality rates, treatment costs, feed efficiency, product quality, and marketability. Implementing preventative measures, such as proper nutrition, biosecurity protocols, and effective management practices, is crucial to minimizing the economic impact of non-infectious diseases in poultry.

Self-Check – 3	Written test

Name_____ ID_____ Signature_____ date_____

Directions: Answer all the questions below according to the instruction

Part I: Say True or False (1pt each)

1. Poultry diseases are always caused by infectious agents
2. Nutritional imbalances cannot lead to poultry diseases
3. Environmental stressors have no impact on poultry heal
4. Genetic abnormalities are not a non-infectious cause of poultry disease
5. Trauma or physical injuries do not contribute to poultry diseases

Part II: Short Answer Questions (2pts each)

1. Which bacterial disease causes respiratory symptoms, such as coughing and sneezing, in poultry
   A. Salmonellosis
   B. Avian Influenza
   C. Mycoplasmosis
   D. Colibacillosis

2. Which bacterial disease is characterized by swollen joints and lameness in poultry?
   A. Infectious Coryza
   B. Fowl Cholera
   C. Pasteurellosis
   D. Pullorum Disease

3. Which bacterial disease causes diarrhea, decreased egg production, and sometimes sudden death in poultry?
   A. Campylobacteriosis
   B. Coccidiosis

C. Necrotic Enteritis

D. Infectious Bronchitis

4. Which bacterial disease is commonly known as "bacterial food poisoning" and can be transmitted to humans through contaminated poultry products?

A. Erysipelas

B. Botulism

C. Clostridiosis

D. Salmonellosis

5. Which bacterial disease is characterized by swollen, cyanotic (bluish) wattles and combs in poultry?

A. Avian Tuberculosis

B. Avian Cholera

C. Fowl Typhoid

D. Infectious Bursal Disease

6. Which bacterial disease causes swollen sinuses, facial edema, and a swollen, twisted neck in poultry?

A. Ornithobacteriosis

B. Avian Rhinotracheitis

C. Avian Mycoplasmosis

D. Infectious Laryngotracheitis

7. Which bacterial disease is characterized by sudden death, often without any clinical signs, in young poultry?

A. Fowl Pox

B. Marek's Disease

C. E. coli infection

D. Pasteurellosis

8. Which bacterial disease causes eggshell discoloration and shell quality problems in laying hens?

A. Avian Encephalomyelitis

B. Avian Leukosis

C. Avian Salmonellosis

D. Infectious Bronchitis

8. Which bacterial disease is commonly known as "infectious sinusitis" and causes nasal discharge and sneezing in poultry?

A. Avian Coryza
B. Avian Pasteurellosis
C. Avian Chlamydiosis
D. Avian Pox

9. Which bacterial disease is characterized by depression, decreased appetite, and diarrhea, often leading to high mortality rates in poultry?

A. Erysipelas
B. Pullorum Disease
C. Colibacillosis
D. Infectious Bursal Disease

Note: Satisfactory rating - 6 points Unsatisfactory - below 4 points

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

LG # 33 LO4 # Implement poultry health management and bio security

Instruction sheet 4

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

- Biosecurity measures in the prevention of poultry disease
- Poultry house sanitation and management
- Identification, isolation and culling of sick birds
- Planning vaccination programme

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 implement prevention and control measures
- Implement strict bio-security measures
- Carry out good sanitation and litter management
- Ensure appropriate spacing and free air circulation
- Carry out quick identification and culling /separation of sick birds
- Plan vaccination schedule and administer right vaccine type.

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

5.1. Biosecurity measures in the prevention of poultry disease

Biosecurity is defined, in general terms, as the set of sanitary and preventive measures that, if applied permanently, prevent and avoid the entry and exit of infectious agents. Biosecurity measures play a critical role in preventing and controlling poultry diseases. By implementing effective biosecurity practices, poultry farmers can reduce the risk of disease introduction and spread within their flocks. Here are some key biosecurity measures for poultry disease prevention:

A. **Controlled Access**: Limit and control access to the poultry farm to authorized personnel only. Install secure entry points and implement visitor protocols, including footbaths, hand hygiene stations, and protective clothing. Restrict access to non-essential personnel, vehicles, and equipment.

B. **Perimeter Security**: Secure the perimeter of the farm to prevent unauthorized entry. Install fencing, gates, and signage to clearly mark the boundaries and deter trespassing.

C. **Facility Design**: Ensure that the farm layout and design facilitate biosecurity. Designate specific entry and exit points for personnel, equipment, and vehicles. Establish dedicated areas for clean and dirty zones to prevent cross-contamination. Separate different age groups or production stages of birds to minimize disease transmission.

D. **Vehicle and Equipment Biosecurity**: Clean and disinfect vehicles and equipment before entering the farm premises. Have designated areas for washing and disinfecting vehicles and equipment. Regularly inspect and maintain equipment to prevent potential sources of disease transmission.

E. **Personnel Biosecurity**: Provide comprehensive training to all farm personnel on biosecurity protocols, including proper hygiene practices, use of protective clothing, and disease recognition. Enforce strict adherence to these protocols at all times.

F. **Animal Health Monitoring**: Implement a robust animal health monitoring program to detect and respond to any signs of disease promptly. Train farm personnel to recognize

abnormal behavior, symptoms, or signs of illness in the birds and establish protocols for reporting and addressing such cases.

G. **Disease Prevention**: Follow vaccination schedules recommended by veterinarians or poultry health professionals to protect birds against specific diseases. Properly store and handle vaccines to ensure their effectiveness. Implement pest control measures to prevent the introduction and spread of pests that can carry diseases.

H. **Feed and Water Safety**: Ensure that feed and water sources are of high quality and free from contaminants. Regularly inspect and clean feeders and waterers to prevent the buildup of mold, bacteria, or other potential sources of disease.

I. **Mortality Management**: Properly manage and dispose of bird mortalities to minimize disease transmission risks. Follow appropriate protocols for carcass disposal, such as burial, composting, or incineration, to prevent scavenging by wildlife or other animals.

J. **Record Keeping**: Maintain accurate and detailed records of flock health, vaccination history, medications administered, mortality rates, and other relevant information. These records are essential for disease surveillance, traceability, and management decisions.

K. **Collaboration and Reporting**: Foster communication and collaboration with veterinary professionals, industry organizations, and regulatory agencies. Report any unusual or suspected disease occurrences promptly to the appropriate authorities.

By implementing and maintaining strict biosecurity measures, poultry farmers can significantly reduce the risk of disease introduction and spread, safeguarding the health and productivity of their flocks. There are a large number of infectious diseases whose prevention and control measures are strongly related to the biosecurity managed on the farm. Such diseases as ***Avian cholera, Newcastle disease, Marek's disease, Salmonellosis, Coccidiosis, Mycoplasmosis, Colibacillus, and Avian Influenza***, among others.

5.2. Poultry house sanitation and management

Poultry house sanitation and management are essential for creating a clean and healthy environment for poultry. Proper sanitation practices help prevent the spread of diseases, improve bird welfare, and optimize production efficiency. Here are key considerations for poultry house sanitation and management:

- **Cleaning and Disinfection:** Regularly clean and disinfect the poultry house to remove organic matter, pathogens, and parasites. Remove all litter and debris, and thoroughly clean surfaces, equipment, and feeders. Use appropriate detergents and disinfectants approved for poultry facilities may be:
  - ✓ **Quaternary Ammonium Compounds** (QACs): QACs, such as benzalkonium chloride and dodecylbenzenesulfonic acid, are widely used disinfectants in the poultry industry. They are effective against a broad spectrum of bacteria, viruses, and fungi. QACs are often used for general surface disinfection, equipment cleaning, and sanitizing poultry housing.
  - ✓ **Phenolic Compounds**: Phenolic disinfectants, such as ortho-phenylphenol (OPP) and cresols, have antimicrobial properties and are commonly used in poultry production. They are effective against many pathogens and have residual activity. Phenolic compounds are often used for disinfection of poultry houses, equipment, and hatcheries.
  - ✓ **Chlorine Compounds**: Chlorine-based disinfectants, such as sodium hypochlorite (bleach) and chlorine dioxide, are widely used in poultry production. They are effective against various microorganisms and can be used for disinfecting water supply systems, equipment, and poultry housing. However, caution should be exercised when using chlorine compounds to avoid excessive concentrations that can be harmful to birds.
  - ✓ **Peroxygen Compounds**: Peroxygen-based disinfectants, such as hydrogen peroxide and peracetic acid, are environmentally friendly and have broad-spectrum antimicrobial activity. They are effective against bacteria, viruses, fungi, and spores. Peroxygen compounds are often used for surface disinfection, water treatment, and egg sanitation in poultry production.

- ✓ **Iodine Compounds**: Iodine-based disinfectants, such as povidone-iodine and iodophors, are effective against a wide range of microorganisms. They have good residual activity and can be used for disinfection of poultry housing, equipment, and egg sanitation.
- ✓ **Glutaraldehyde**: Glutaraldehyde is a powerful disinfectant with broad-spectrum antimicrobial activity. It is effective against bacteria, viruses, fungi, and spores. Glutaraldehyde is often used for equipment and surface disinfection in poultry production.

- **Isolation** is a basic and sound principle for preventing disease in your flock. Anything that moves, living or non-living, can be a vector and bring pathogenic agents to your birds. The wind can carry virus particles for long distances. They can be attached to dust, equipment, animals or people. Strive to keep your birds from being unnecessarily exposed to disease by the following practices:
  - Purchase only newly hatched chicks or fertile eggs for stock replacement.
  - If you must purchase adult birds, quarantine them for four weeks before adding to flock.
  - Keep people, dogs, cats, and vehicles out of poultry houses.
  - Wear clean clothing in your poultry house, especially shoes that you do not wear elsewhere.
  - Do not enter other people's poultry houses. If you do, change clothes, shoes and wash prior to working with your own flock.
  - Screen all openings to control insects, rodents and wild birds.
  - Care for young birds first, then older birds and finally birds that are ill. Working healthiest to sickest helps prevent spread of diseases to your healthy birds.
- **Sanitation** should be a way of life. The most effective sanitizer is hot water, detergent and a brush. Be sure to first use the shovel and scraper. Remove as much filth, litter, organic matter, and debris as possible before trying to sanitize a surface. Chemicals will not substitute for a good cleaning program. However, sunlight does not penetrate well and may require days to be effective.
  - Place new birds in a well-cleaned, dry and sanitized pen.

- Allow houses to remain clean and vacant at least two weeks between broods or flocks.
- Keep equipment, especially waterers, clean and sanitary.
- Remove manure from pens and dispose of it promptly. Do not stockpile it near the poultry house.
- Manage rodents by eliminating habitat and access to feed and water sources.

- **Flock Management** is a combination of all the above factors and many others to make your poultry project a sound, enjoyable and profitable enterprise.
    - Purchase only strong, vigorous, healthy stock.
    - Follow sound health and welfare practices.
    - Sanitize and set up brooder facilities and have them working properly before new chicks arrive.
    - Keep different aged birds separate.
    - Follow an all-in-all-out replacement program.
    - If you must have two or more age groups on one farm, care for the youngest first and work toward the oldest birds.
    - Replace your stock on a regular basis.
    - Be considerate of your neighbors.
- **Litter Management**: Choose suitable litter material, such as wood shavings, straw, or rice hulls, and maintain appropriate depth. Monitor and manage litter moisture levels to prevent excessive ammonia production and the growth of harmful bacteria. Regularly turn and replace litter as needed to maintain a dry and clean environment.
- **Ventilation**: Ensure proper ventilation in the poultry house to maintain good air quality, control temperature, and remove excess moisture and ammonia. Regularly inspect and maintain ventilation systems to ensure adequate airflow and proper functioning.
- **Rodent and Pest Control**: Implement measures to control rodents, insects, and other pests that can carry diseases and cause damage. Seal entry points, use rodent-proof feed storage containers, and regularly monitor for signs of pest activity. Employ appropriate pest control methods while ensuring the safety of the birds.

- **Water Management**: Provide clean and fresh water to the birds at all times. Regularly clean and disinfect waterers to prevent the buildup of biofilm and the spread of waterborne diseases. Monitor water quality and ensure that water sources are free from contaminants.
- **Biosecurity Measures**: Implement biosecurity protocols to minimize the risk of disease introduction and transmission. This includes controlling access to the poultry house, restricting movement of personnel and equipment, and implementing proper hygiene practices.
- **Lighting**: Provide appropriate lighting conditions based on the age and type of birds. Proper lighting management helps maintain bird welfare, behavior, and production. Ensure consistent lighting duration and intensity, following recommended guidelines.
- **Feed Management**: Store feed properly in clean and dry conditions to prevent spoilage and contamination. Regularly inspect feed storage areas for signs of pests or mold. Follow recommended feeding practices and avoid overfeeding, as excess feed can attract pests and lead to litter contamination.
- **Monitoring and Record Keeping**: Regularly monitor flock health, behavior, and performance. Keep records of important parameters such as mortality rates, feed consumption, weight gain, and vaccination schedules. This information assists in identifying trends, addressing issues, and making informed management decisions.
- **Training and Staff Awareness**: Provide training to farm personnel on proper sanitation practices, biosecurity measures, and flock management techniques. Ensure all staff members are aware of their roles and responsibilities in maintaining a clean and healthy poultry house.

5.3. Identification, isolation and culling of sick birds

Identification, isolation, and culling of sick birds are important steps in managing disease outbreaks and preventing the spread of illnesses within a poultry flock. Here's a general overview of the process:

i. Identification: Regular and vigilant monitoring of the flock is crucial to identify sick birds promptly. Look for signs of illness, including decreased activity, lethargy, reduced appetite, abnormal droppings, respiratory distress, lameness, or unusual behavior. Conduct routine health checks and observations to detect any abnormalities early on.

ii. Isolation: Once a sick bird is identified, it should be promptly isolated from the rest of the flock to prevent disease transmission. Move the bird to a separate, well-ventilated, and clean isolation area. Ideally, this area should have its own equipment and tools to avoid cross-contamination. Provide appropriate care and treatment to the isolated bird as recommended by a veterinarian.

iii. Veterinary Consultation: Seek the guidance of a veterinarian for a proper diagnosis and recommended treatment options. A veterinarian can help determine the cause of illness and suggest appropriate measures to prevent further spread. Follow their instructions regarding treatment, medication administration, and biosecurity protocols.

iv. Culling: In cases where the illness is severe, highly contagious, or poses a significant risk to the rest of the flock, culling may be necessary. Culling involves humanely euthanizing the sick bird to prevent suffering and eliminate the source of infection. Culling decisions should be made in consultation with a veterinarian or animal health professional.

v. Biosecurity Measures: During the identification, isolation, and culling process, it is essential to maintain strict biosecurity measures to prevent disease transmission. Adhere to proper hygiene practices, such as handwashing, disinfection of equipment, and use of personal protective equipment (PPE). Minimize contact with other birds and implement measures to prevent the spread of pathogens through equipment, clothing, or personnel.

vi. Record Keeping: Maintain detailed records of sick birds, including their symptoms, treatment administered, and outcomes. Accurate record-keeping helps track disease patterns, identify potential sources of infection, and evaluate the effectiveness of management protocols.

Notes: that the identification, isolation, and culling of sick birds should always be performed with the guidance of a veterinarian or animal health professional. They can provide specific recommendations based on the nature of the illness, flock health status, and applicable laws and regulations.

5.4. Planning vaccination programme

Developing a vaccination program for commercial layers in Ethiopia requires consideration of the prevalent diseases in the region and the specific needs of the flock. Here are some common vaccines and a suggested vaccination schedule for commercial layers in Ethiopia:

b. Newcastle Disease (ND):

- Vaccine: Live attenuated Newcastle Disease vaccine (LaSota strain or other suitable strains)
- Route: Eye drop or drinking water
- Vaccination Schedule:
  - ✓ Primary Vaccination: Administer the first dose of ND vaccine at 1-7 days of age.
  - ✓ Booster Vaccination: Provide a second dose of ND vaccine at 3-4 weeks of age.
  - ✓ Follow-up Booster: Administer periodic booster doses based on the disease prevalence and vaccine efficacy, usually every 3-4 months.

c. Infectious Bronchitis (IB):

- Vaccine: Live attenuated Infectious Bronchitis vaccine (suitable strain based on local serotypes)
- Route: Eye drop or drinking water
- Vaccination Schedule:
  - ✓ Primary Vaccination: Administer the first dose of IB vaccine at 1-7 days of age.
  - ✓ Booster Vaccination: Provide a second dose of IB vaccine at 3-4 weeks of age.
  - ✓ Follow-up Booster: Administer periodic booster doses based on the disease prevalence and vaccine efficacy, usually every 3-4 months.

d. Avian Influenza (AI):

- Vaccine: Inactivated Avian Influenza vaccine (H5N1 or other suitable strains)

- Route: Intramuscular injection
- Vaccination Schedule:
  - ✓ Initial Vaccination: Administer the first dose of AI vaccine at 6-8 weeks of age.
  - ✓ Follow-up Vaccination: Provide periodic booster doses based on the disease prevalence and vaccine efficacy, typically every 4-6 months.

e. Egg Drop Syndrome (EDS):

- Vaccine: Inactivated Egg Drop Syndrome vaccine
- Route: Intramuscular injection
- Vaccination Schedule:
  - ✓ Initial Vaccination: Administer the first dose of EDS vaccine at 14-16 weeks of age.
  - ✓ Follow-up Vaccination: Provide periodic booster doses based on the disease prevalence and vaccine efficacy, typically every 4-6 months.

f. Salmonella:

- Vaccine: Inactivated Salmonella vaccine (specific serotypes based on local prevalence)
- Route: Intramuscular injection or drinking water
- Vaccination Schedule:
  - ✓ Initial Vaccination: Administer the first dose of Salmonella vaccine at 14-16 weeks of age.
  - ✓ Follow-up Vaccination: Provide periodic booster doses based on the disease prevalence and vaccine efficacy, typically every 4-6 months.

g. Marek's Disease:

- Live attenuated vaccines (various strains)
- Rispens strain (commonly used)

h. Fowl Pox:

- Live attenuated vaccines
- Inactivated vaccines

i. Coccidiosis:

- Live attenuated or inactivated vaccines (specific species-based vaccines)

j. Mycoplasma synoviae (MS):

- Inactivated vaccines

Remember to maintain proper storage and handling of vaccines, follow recommended administration techniques, and maintain accurate vaccination records. Additionally, implement appropriate biosecurity measures, such as controlling access to the farm area, practicing good hygiene, and minimizing contact with potential disease vectors. Consulting with a veterinarian or poultry health professional is crucial to tailor the vaccination program to the specific needs of your flock and the prevalent diseases in your region. They can provide specific guidance based on local disease information, vaccine availability, and your production system.

Vaccination Program for Broilers

Age	Vaccine	Route	Type
1 day	Marek's disease	SC	Turkey herpesvirus and SB-1 or Rispens strain for high-challenge areas
1 day	Newcastle disease	Coarse spray (see spray cabinet image)	Broilers (most common dosing regimen)
14–21 days		Drinking water or coarse spray	Broilers (optional 2nd dose)
1 day or	Infectious bronchitis	Coarse spray	Lasota
		Drinking water or coarse spray	Attenuated/Boaster vaccine
14–21 days	Infectious bursal	Drinking water	Intermediate

This is an example of a typical vaccination program. Individual programs are highly variable and reflect local conditions, disease prevalence, severity of the challenge, and individual preferences.

Vaccination Program for Commercial Layers

Age	Vaccine	Route	Type
14-21 days	Marek disease	SC	Turkey herpesvirus and SB-1
1 day	Newcastle/infectious bronchitis	Drinking water	B1/Massachusetts
	Infectious bursal disease	Drinking water	Intermediate
5 weeks	Newcastle/Infectious bronchitis	Drinking water/ Coarse spray	B1/Massachusetts
8-10 weeks	Newcastle/Infectious bronchitis	Drinking water or coarse spray	B1 or Lasota/Massachusetts
10-12 week	Encephalomyelitis	Wing vein	Live, Chick-embryo origin
	Fowlpox	Wing vein	Modified live
	Laryngotracheitis	Intraocular	Modified live
10-14 week	*Mycoplasma gallisepticum*	Parenteral	Inactivated
12-18 week	Newcastle/infectious bronchitis	Drinking water or aerosol	B1 or LaSota/Massachusetts
60-90 days	Newcastle/infectious bronchitis	Parenteral	Inactivated

Notes: The use of M. *gallisepticum* vaccine is regulated or prohibited in some states. SB-1 or MDV301 may be combined with turkey herpesvirus in some areas, or Rispens strain may be used in high-challenge areas. Vaccination for infectious bursal disease, laryngotracheitis, and fowlpox depends on local requirements. Other strains of infectious bronchitis (Connecticut, Arkansas 99, Florida 88, etc.) are included in some areas.

Self-Check – 4	**Written test**

Name_____ **ID**_____**signature**_____ **date**_____

Directions: Answer all the questions below according to the instruction

Part I: Multiple choice (2 pt each)

1. Non-infectious causes of poultry diseases are solely related to environmental factors.
2. Nutritional deficiencies can contribute to the development of poultry diseases.
3. Genetic factors play no role in the occurrence of non-infectious poultry diseases.
4. Incorrect management practices can lead to non-infectious poultry diseases.
5. Vaccination is the primary method for preventing non-infectious poultry diseases.

Part II: Short answer questions (2pts each)

1. What is the term for a condition caused by an imbalance or deficiency in a specific nutrient in poultry?
2. Name one non-infectious poultry disease that can result from poor housing conditions.
3. What is the primary cause of non-infectious skeletal disorders in poultry?
4. List two common dietary deficiencies that can affect the immune system of poultry
5. How can water quality issues lead to non-infectious poultry diseases?
6. What is the term for a sudden increase in light intensity that can cause stress and health issues in poultry
7. Name one non-infectious poultry disease caused by exposure to toxic substances.
8. How can poor ventilation in poultry housing contribute to the development of non-infectious diseases?

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

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

Reference Materials

BOOKS

Deere, D. U., & Miller, R. P. (1966). *Engineering classification and index properties for intact rock* (pp. 6-10). Springfield, VA, USA: National Technical Information Service.

Gerlach, H., & Schmidt, H. P. (2012). Biochar in poultry farming. *Ithaka Journal*, *1*(2012), 262-264.

Kitalyi, A. J. (1998). *Village chicken production systems in rural Africa: Household food security and gender issues* (No. 142). Food & Agriculture Org.

Patrick, H., & Schaible, P. J. (1980). *Poultry: feeds and nutrition* (No. Ed. 2).

Prabakaran, R. (2003). Good practices in planning and management of integrated commercial poultry production in South Asia.

Sebar, B. M. (2008). *Engendering Occupational Health and Safety: RSI in the Poultry Processing Industry*. Griffith University.

Swayne, D. E. (2013). *Diseases of poultry*. John Wiley & Sons.

Articles

Abdisa, T., & Tagesu, T. (2017). Review on Newcastle disease of poultry and its public health importance. *J. Vet. Sci. Technol*, *8*(3), 441.

Birhane, N., & Fesseha, H. (2020). Vaccine Failure in Poultry Production and its Control Methods-A Review. *Biomed. J. Sci. Tech. Res*, *29*, 22588-22596.

Hafez, H. M., & Attia, Y. A. (2020). Challenges to the poultry industry: Current perspectives and strategic future after the COVID-19 outbreak. *Frontiers in veterinary science*, *7*, 516.

Hunduma, D., Regassa, C., Fufa, D., Endale, B., & Samson, L. (2010). Major constraints and health management of village poultry production in rift valley of Oromia, Ethiopia. *Global veterinaria*, *5*(1), 6-10.

Javed, M. T., Rizvi, F., & Saleemi, M. K. (2015, December). on Poultry Diseases. In *Proceedings of the "lnternational Seminar on Poultry Diseases" l4*.

Nawab, A., Ibtisham, F., Li, G., Kieser, B., Wu, J., Liu, W., ... & An, L. (2018). Heat stress in poultry production: Mitigation strategies to overcome the future challenges facing the global poultry industry. *Journal of thermal biology*, *78*, 131-139.

Pesti, G. M., & Choct, M. (2023). The future of feed formulation for poultry: toward more sustainable production of meat and eggs. *Animal Nutrition*.

Ranjan, A., Sinha, R., Devi, I., Rahim, A., & Tiwari, S. (2019). Effect of heat stress on poultry production and their managemental approaches. *International Journal of Current Microbiology and Applied Sciences*, *8*(02), 1548-1555.

Tadesse, D. T. (2012). Management practices, productive performances and egg quality traits of exotic chickens under village production system in east Shewa, Ethiopia (Doctoral dissertation, Addis Ababa University).

Yazdanparast, T., Strezov, V., Wieland, P., Lai, Y. J., Jacob, D. E., & Taylor, M. P. (2022). Lead poisoning of backyard chickens: implications for urban gardening and food production. *Environmental Pollution*, *310*, 119798.

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