

COURSE GUIDE

ANP 506 ANIMAL HEALTH AND DISEASES

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INTRODUCTION

ANP506 – Animal Health and Diseases is a 2-credit course intended to expose you to common causes and types of important livestock diseases in Nigeria and methods used to prevent disease occurrence including principles of animal health management. Disease is the second most important cause of production losses in Nigerian livestock industry and poor animal health remains a constraint to livestock productivity. It is necessary that animals are in good health not only to ensure absence of diseases and consequently wholesome food of animal origin but also to enhance maximum return on investment in animal production.

Animal Health and Diseases examines the causes and effects of important diseases of food animals in Nigeria especially ruminants. The course also describes how these diseases can be prevented or controlled to minimize their effects on livestock. This course is designed to equip you with the basic knowledge of animal health maintenance necessary for food animal production.

The course consists of two parts – Course Guide and the Main Text. You are required to read the course guide before proceeding to the main text. The course guide describes what the course is about and how you will use the course materials to aid your learning in the course. The course facilitator is expected to read the course guide session as guide on facilitation of this course.

WHAT YOU WILL LEARN IN THIS COURSE

In this course you will learn the basic concepts in animal health and disease management as well as the causes of important livestock diseases. You will also learn the methods used in the prevention, treatment and control of common livestock diseases and the importance of applying this knowledge in reducing the impact of disease on the livestock industry in Nigeria.

COURSE AIM

This course aims at equipping you with skills and knowledge necessary to maintain basic animal health management practices on a farm.

COURSE OBJECTIVES

The objectives of this course are:

1. Describe the factors that affect the health status of animals
2. Understand how to identify sick animals
3. Explain the causes of some important Ruminant livestock diseases in Nigeria
4. List the common diseases shared between animals and man (zoonotic diseases)

5. State the methods used in prevention, treatment and control of livestock diseases
6. Discuss the impact of diseases on the livestock industry in Nigeria

WORKING THROUGH THIS COURSE

This course is made up of three modules and thirteen study units as follows:

Module 1 General concepts in animal health management and disease

- Unit 1 Basic terms used in animal health and disease
- Unit 2 Factors affecting the health status of animals
- Unit 3 General classification of livestock diseases
- Unit 4 Principles of Animal immunity
- Unit 5 Prevention and Control of livestock diseases

Module 2 Common Diseases of livestock in Nigeria and their causes

- Unit 1 Bacterial diseases
- Unit 2 Viral diseases
- Unit 3 Parasitic diseases
- Unit 4 Metabolic/Nutritional diseases
- Unit 5 Plant poisoning

Module 3 Impact of Livestock diseases and Treatment in Nigeria

- Unit 1 Impact of livestock diseases on the Nigerian livestock industry
- Unit 2 Zoonosis and Public health significance of livestock diseases
- Unit 3 Treatment of livestock diseases

Every unit contains a list of references and further reading. Try to get the textbooks and materials listed. The textbooks and materials are meant to deepen your knowledge of the course.

Apart from the print course material, you will equally have the soft copy of the material in NOUN web site – www.nou.edu.ng. When you get to the site, click on course ware and select this course.

This course will be facilitated through face-to-face at the study centres and online through iLearn platform. In the platform you will receive both synchronous and asynchronous facilitations supplemented with video tapes. To get to i-learn platform, click on www.nou.edu.ng, and click on i-Learn.

ASSESSMENTS

The assessments are in four forms – self-assessment exercises, Tutor Marked Assignments (TMAs), Computer Marked Assignments (CMAs), and final examination.

The self-assessment exercises are provided for you to check your progress. Each unit has self- assessment exercises within the texts, and the answers are provided at the end of each unit. You should be sincere when working on the self-assessment exercises. Do not be quick at looking at the answers. Check the answers only when you know you have sincerely completed the questions asked. It is only by this way you will find the questions helping to aid your learning and mastery of the skills. The self-assessment exercises will not be scored.

The TMAs and CMAs will be scored and they will form part of the final assessment for graduation. There will be four continuous scored assessments in this course. The first assessment is the CMA. This will be multiple choice questions that you will take through the computer and you will have immediate score feedback. In addition, you will take three TMAs. These will be practical questions where you will be tested

STUDY UNITS

The study units for this course are arranged in three modules and comprises of the following:

Module 1 General concepts in animal health management and disease

- Unit 1 Basic terms used in animal health and disease
- Unit 2 Factors affecting the health status of animals
- Unit 3 General classification of livestock diseases
- Unit 4 Principles of Animal immunity
- Unit 5 Prevention and Control of livestock diseases

Module 2 Common Diseases of livestock in Nigeria and their causes

- Unit 1 Bacterial diseases
- Unit 2 Viral diseases
- Unit 3 Parasitic diseases
- Unit 4 Metabolic/Nutritional diseases
- Unit 5 Plant poisoning

Module 3 Impact of Livestock diseases and Treatment in Nigeria

- Unit 1 Impact of livestock diseases on the Nigerian livestock industry
- Unit 2 Zoonosis and Public health significance of livestock diseases
- Unit 3 Treatment of livestock diseases

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MODULE 1 GENERAL CONCEPTS IN ANIMAL HEALTH MANAGEMENT AND DISEASE

Unit 1	Basic terms used in animal health and disease
Unit 2	Factors affecting the health status of animals
Unit 3	General classification of livestock diseases
Unit 4	Principles of Animal immunity
Unit 5	Prevention and Control of livestock diseases

UNIT 1 BASIC TERMS USED IN ANIMAL HEALTH AND DISEASE

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1.0	Introduction
2.0	Objectives
3.0	Main content
3.1	Definition of common terms used in animal health
3.2	Recognition of sick animals
4.0	Conclusion
5.0	Summary
6.0	Tutor-Marked Assignment
7.0	References/Further Reading

1.0 INTRODUCTION

Animals that are healthy will perform well and produce maximally for the benefit of man. Diseases generally reduce the performance or productivity of animals especially food animals (livestock) and ruminants in particular. It is therefore important that good animal management practices be observed on a farm or where animals are kept not just to keep diseases away but for maximum performance.

There are basic terminologies that are used when describing animal health and diseases and these are to be understood. This unit will define or explain the certain basic terms used in animal health. It will also describe how you can recognize sick animals and the action to take in order to determine the cause or aetiology of the disease affecting a sick animal. The objective of this unit is given below.

2.0 OBJECTIVES

After going through this unit, you should be able to:

- Define or explain some common terminologies used in relation to animal health such as disease, diagnosis, symptoms or clinical signs, immunity, disease prevention, disease control among others.

- Know what to look out for when animals are sick
- Know how diagnosis are arrived at
- Know how diseases are classified or grouped
- Understand the basis of immunity to diseases as well as the principle underlying prevention and control of animal diseases.

3.0 MAIN CONTENT

3.1 Definition of common terms used in animal health

An animal is said to be in good health when it is in a complete state of physical, social and mental well-being and not just that the animal is free from disease. This means that the animal in question must be adequately cared for with respect to provision of feed, water, space, clean environment etc. An animal that lacks these basic provisions can easily come down with a disease.

Disease is a deviation from the normal and is revealed by changes in the animal. Any animal that has a disease will show some abnormality. This change in the animal can be observed from the behavior, structure or function of the animal in question. A sick animal will look dull and weak (lethargy), stay on its own and will refuse to feed (anorexia). A dairy animal that produces milk will have a drop in the quantity of milk produced. You can also notice a change in shape in areas of the body structure of a sick animal depending on the part or organ of the body that is affected. These changes can be major or minor depending on the severity of the disease condition and it can also be qualitative or quantitative.

The observable changes seen or noticed when an animal is sick is known as symptoms or clinical signs. There are symptoms or clinical signs that are common to most diseases while some are specific to particular diseases. Some of the common symptoms seen in most diseases include: refusal to eat, fever or pyrexia (increase in body temperature), dullness etc.

The changes observed when an animal is sick is a basis for diagnosis or determining what is causing the sickness in the animal, and diagnosis can be defined as the art and science of determining the nature and causes of diseases and differentiating between diseases.

To arrive at a diagnosis, you have to get some information or facts about the animal. The information you gather or collect should be as comprehensive as possible and these can be regarded as components of diagnosis. These include:

- History taking:- This is gathering some information about the animal such as identity of the animal (specie, name or tag no., age, sex, breed, colour of the animal etc), when the animal was first noticed to have changed in behavior or performance, how long this condition has been on etc

- **Physical examination:-** This done by observing the animal itself for any sign of abnormality, taking the temperature, pulse rate, respiratory rate. If this done on a farm, it can include looking at the housing and environment where the animal is kept, the type of feed given to the animal or animals etc.
- **Laboratory examination:-** This is carried out on samples or materials collected from the animal or the environment where the animal is kept. The sample collected is subjected to several laboratory procedures to detect the presence or absence some disease-causing agents or substances. Examples of samples collected from a sick animal include blood, faeces, skin scrapings, urine or even organs of a dead animal (especially, where there are many animals on a farm) etc. Also, some part feed of the given to the animal can be collected for laboratory examination. Laboratory examination of samples collected from sick animals is important in arriving at a definitive diagnosis.

3.2 Recognition of sick animals

Diseases result in a disturbance in the normal behavior, activity or performance of the animal or animals. In most cases you can observe this change in behavior, activity or performance. General signs or symptoms of sick animals are:-

- Anorexia (inappetance) – the animal goes off feed or refuses to eat
- Fever (pyrexia) – this an increases in body temperature of the animal above normal
- Weakness (lethargy)
- Depression

These symptoms or clinical signs may not all be present in all diseases all the times. For example an animal suffering from helminthosis (worm infestation) may not show fever unless this condition has another concurrent infection.

4.0 CONCLUSION

At this point you have understood that it is important to keep animals healthy and can explain or define some common terminologies used in animal health. You have also learnt basic things that are done to determine the cause of a disease or a diagnosis is arrived at. In addition, you have also learnt some general observable signs of a sick and what samples can be collected from sick animal for further examination to support a correct diagnosis.

At this stage you can define or explain terminologies like disease, diagnosis as well as describe steps used to arrive at diagnosis of a sick animal. You should also be able to mention some general signs of a sick animal. In fact if you are present on farm when veterinary doctor come to look at a sick animal, you know some initial or basic things he will do to determine the cause of sick animal.

5.0 SUMMARY

This unit is an introduction and has shown that keeping animals healthy is important for optimum production and defined some basic terminologies used in relation to animal health and diseases. The unit has also revealed the steps involved in arriving at the diagnosis of a sick animal as well as given some general symptoms or clinical sign of diseases in animals.

will further discuss the factors that affect the health status of animals and the predisposing conditions to diseases.

6.0 TUTOR MARKED ASSIGNMENT

Using your own words, explain what you understand by the terminologies: Diagnosis, Diseases List the general signs or symptoms you see in a sick animal
List three samples that can be taken from a sick animal to help the veterinary doctor arrive at a correct diagnosis.

7.0 REFERENCES/FURTHER READING

Tropical Animal Health, Horst S.H. Seifert

Radostits, O.M., Gay, C.C., Blood, D.C., and Hinchcliff, K.W., 2000. Veterinary Medicine. A Textbook of the Diseases of Cattle, Sheep, Pigs, Goats and Horses, 9th Ed. W.B. Saunders, Philadelphia

Herd Health: Food Animal Production Medicine, 2nd edition, eds. Radostitis, Leslie and Fetrow

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UNIT 2 FACTORS AFFECTING THE HEALTH STATUS OF ANIMALS

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- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main content
- 3.1 Environmental factors
- 3.2 Management Factors
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Reading

1.0 INTRODUCTION

The state or condition of an animal or group of animals to large extent determines how it reacts to the presence of an infectious agent. An infectious agent is a disease causing microorganism such as a bacteria, virus etc. Healthy animals can withstand or offer some resistance to infectious agents. However, stress (physical, nutritional or otherwise) decreases the ability of animals to resist infectious agents or other disease-causing parasites. In animal production, it is important to ensure that animals are in relatively healthy state or conditions at all times. This also helps to ensure maximum return on investment in commercial farms and keeping the animals safe.

In order for an animal to come down with a disease, certain factors must be present. These factors are conditions which enable an infection to be established or support the development and/or multiplication of disease causing microorganisms or parasites. The factors that influence the health status of animals are many; some can be controlled while others are not. These may be classified as environmental and management factors. These factors vary in their degree of importance with respect to different diseases. This unit will discuss the factors that affect the health status of animals and how these factors contribute to causing or reducing disease conditions of animals.

2.0 OBJECTIVES

At the end of this unit you should be to:

- List the factors that affect the health status of animals.
- Differentiate between environmental and management factors affecting the health status of animals.

You should also be able to state which of these factors are controllable and which ones are not.

3.0 MAIN CONTENT

3.1 Environmental Factors

These factors which are physical in nature influence the health status of animals to varying degrees and they cannot be controlled on the field. They can however, be controlled in an animal facility depending on the sophistication of the facility and the species of livestock. These factors are:

- **Temperature** - Animals have the ability to withstand severe temperatures but this will significantly affect productivity if the exposure is for a long period. This is because the animal will become stressed and stress increases susceptibility to disease.
- **Humidity** - High humidity will promote the growth of certain microorganisms like fungus whereas too low a humidity will result in irritation of the mucous membrane. Humidity is important in poultry since they do not have sweat glands and heat is lost through the respiratory tract.
- **Solar radiation** - This also plays a role in increasing the heat load on an animal. This takes on special importance in hot humid zones especially in Nigeria with the importation of exotic animals or use of exotic semen from temperate countries to upgrade indigenous livestock breeds. Solar radiation can be a problem in animals without pigmentation. However, the effect of radiation can be minimized by the shaded areas or pens.
- **Air movement** – The extent of air movement can help in heat loss through evaporation and conduction/convection. Air circulation assists in the supply of fresh air and removal of toxic air.
- **Rain** – Heavy rainfall can result in excessive cooling for animals and/or marshy conditions where animals are kept. This can predispose animals to conditions such as footrot in ruminants. Provision of shelter and good flooring with drainage is the method to guard against this problem.
- **Climate/Season** – In addition to the environmental factors mentioned above, the climate or season the year can influence the health status of an animal by having a bearing on the infectious agents or parasites that predominate at any particular time. For example, helminth infections are common during the rainy season. This is because temperature and moisture to large extent determines the ability of a parasite to survive outside the host.

3.2 Management Factors

- **Hygiene** - Good hygienic practices are good means of reducing disease risk within a herd or flock. Simple procedures such as cleaning of the where the animals stay or changing of bedding/flooring can help reduce the degree of contamination or parasitism. Cleaning removes faeces and thus disturbs the

normal environment of disease-causing agents such as gastrointestinal parasites by preventing them from completing their life cycle. It is important that feed/water sources are not contaminated.

- **Nutrition** – Adequate feeding of all classes of livestock is important in order to increase disease resistance and achieve maximum production. Poor nutrition leads to poor health. Because of the poor feed resource base for livestock in Nigeria occasioned by the seasonal feed shortage, grazing livestock in Nigeria experience exacerbated condition when exposed to infectious agents. It is therefore necessary to provide supplemental feeding to livestock especially during the dry season. For poultry and other classes of livestock, the high cost of feed ingredients can lead to the compounding of feeds low in nutrients.
- **Type of housing** – Different categories of people use different housing types and different methods to raise livestock depending on the species, resource availability and level of education. The particular housing system and method of raising the animals can influence the rate and severity of an infection especially with parasitic infections. For ruminants, animals that are housed or confined where pasture growth is suppressed or flooring is intact, and feeding/watering troughs are kept above the floor will be at lower risk of diseases of gastrointestinal parasitism. Here, absence of pasture makes the environment not conducive for parasite multiplication. For animals on pasture, the level of pasture contamination depends on factors like concentration of animals, duration of time spent by animals on the pasture, climate or weather condition among others. It is important that the choice of housing and method of raising livestock be such that it decreases the risk of infection or enhances the health status of animals.
- **Ecology/Pest and wildlife**
Most parasites that transmit diseases utilize intermediate host to complete their life cycle. This intermediate host can be a pest or wildlife. It is therefore essential not unnecessarily expose livestock to pest and wildlife. This is problem with ruminant owned by nomads as close contact between these animals and wildlife leads to exchange of parasites.
- **Introduction of new animals/animal number**
There always exists the risk of introducing new parasites into a herd or flock when adding new animals to a herd. This can be problem where replacement animals are bought from the open market or neighbours farm. Any new animal to be added to an existing stock should be quarantined and treated appropriately before addition. The ease and risk disease transmission increases with increase in animal numbers. Increase in animal numbers increases contact between animals and consequently ease of transmission. An increase in animal numbers can also lead to an increase in accumulation of faeces within confined areas and this not good for endoparasitism except where insecticidal eartags are used. In poultry, it is advisable to always clean and disinfect houses before bringing new birds or allowing the house/pen to be empty for sometime.

4.0 CONCLUSION

In this unit you have learnt that certain factors can influence the ease with which an animal can become sick or help in the transmission of diseases in animals. These factors can be from the environment or from the management practices adopted. You have also been told how some of these factors can be controlled to ensure that the risk or ease at which animals become sick is minimized.

5.0 SUMMARY

This unit has examined the factors that impact on the health of animals. These factors exact an influence on productivity and profitability of livestock in general by contributing positively or negatively to the occurrence of diseases. It has also stated the importance of controlling these factors to minimize stress and ensure that animals remain healthy for maximum productivity. Unit 3 will describe how the diseases that affect livestock are transmitted and classified.

6.0 TUTOR-MARKED ASSIGNMENT

1. List three management and environmental factors that affect the health status of animals.
2. In your own words explain how any two of the management factor can negatively affect the health of animals.

7.0 REFERENCES/FURTHER READING

Herd Health: Food Animal Production Medicine, 2nd edition, eds. Radostitis, Leslie and Fetrow

Tropical Animal Health, Horst S.H. Seifert

Van Houtert M.F.J, Sykes A.R. 1996. Implications of nutrition for the ability of ruminants to withstand gastrointestinal nematode infections. *Int J Parasitol* 26:1151–1167

Preston T.R, Leng, R.A. 1987. Matching ruminant production systems with available resources in the tropics and sub-tropics, 1st edn. Penambul Books, Armindale (New South Wales, Australia)

UNIT 3 GENERAL CLASSIFICATION OF LIVESTOCK DISEASES AND METHODS OF TRANSMISSION

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main content
 - 3.1 Causes of Diseases
 - 3.2 Methods of Disease Transmission
 - 3.3 Classification of Diseases
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Reading

1.0 INTRODUCTION

A disease can be described as a condition resulting in a deviation from the normal functional or behavioural status of an animal. Disease can be infectious or noninfectious. Infectious diseases are those diseases that are caused by pathogenic microorganisms such as bacteria, viruses, protozoa and fungi that invade an animal's body and can spread from one animal to another directly or indirectly (contagious). Noninfectious diseases on the other hand are not caused by pathogens rather they can result from nutritional deficiencies, the environment or are inherited (genetics). A pathogen is a disease causing microbial agent. This unit will present the different ways diseases are classified and the methods of disease transmission in animals

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- Classify livestock diseases using varying methods
- State different ways by which diseases are transmitted in animals
- List the causes of diseases.

3.0 MAIN CONTENT

3.1 Causes of Diseases

Diseases are caused by mostly pathogenic microorganisms or parasites which invade, colonize and multiply within the host cells (animal cells) causing a significant change in the body. These pathogens can be bacteria, virus, fungi, protozoa or even a parasite. The first man to associate a particular microbe with a particular disease was Robert Koch in 1877. He attributed the disease anthrax to the organism called *Bacillus anthracis*. The manner in which a disease develops (pathogenesis) differs with different diseases. There are other causes of diseases which include injuries, poisons/chemicals, poor nutrition or genetics.

3.2 Methods of Disease Transmission

Diseases are transmitted from one animal to another through the following ways:

1. **Contact Transmission:** This can be by direct contact between animals that are staying together in the herd or flock or when they meet in open field during grazing or even at animal markets. It can also be indirect contact when animals come in contact with other objects that a sick animal has had contact with'. These objects can non-living (fomite) such as syringes, boots worn by attendants, feeding troughs, pasture etc.
2. **Vehicular Transmission:** This type of transmission occurs via a medium which can through feed (food poisoning), water, air (spores), fluids (saliva) etc.
3. **Vectors:** This type of transmission refers to other animals that carry disease causing agent from one host to another and majority of these are insect or arthropods. They transmit these pathogenic microorganisms and/or parasites either mechanically or biologically. In mechanical transmission, they passively carry the pathogen on their body parts while in biological transmission which usually involves biting action, part of the life cycle of the pathogen occurs within the body of the vector. An example of this when the transmission of Malaria by mosquitoes or Trypanosomosis by Tsetse fly (*Glossina* species).

3.3 Classification of Livestock Diseases

Livestock diseases can be classified using different criteria depending on what best satisfies the situation under consideration. Consequently diseases can be classified based on species of animals (Avian Diseases, bovine diseases, equine diseases, caprine diseases etc); system of the body affected (Cardiovascular diseases, respiratory diseases, reproductive diseases etc) and the causative organism. However, the etiology or causative organism is the most widely used method of classification. Here they are classified as:

- Bacterial diseases - example, Anthrax, Mastitis, Salmonellosis, Fowl typhoid, etc
- Viral diseases – example, Foot and Mouth Disease, Rinderpest, African swine fever etc
- Protozoan diseases – example, Coccidiosis, Trypanosomoses, Babesiosis etc
- Rickettsial diseases – example, Anaplasmosis, Cowdriosis, Infectious keratoconjunctivitis
- Fungal diseases - example, Aspergillosis, Ringworm, Epizootic lymphangitis
- Endoparasitic diseases (caused by worms) – example, Fascioliosis, Haemonchosis etc
- Ectoparasitic diseases (caused by ticks, lice, fleas) - example, Mange, fleabite dermatitis, etc
- Deficiency diseases – Vitamin deficiencies, pregnancy toxemia, etc
- Toxicoses - examples – Nitrate poisoning

Livestock diseases can also be classified on the basis of disease prevention into six categories which are:

- Neonatal diseases – diseases that affect very young animals, mainly diarrhoeal in nature
- Vector-borne diseases – diseases transmitted by a living vector such as trypanosomiasis
- Soil-borne diseases – disease mostly caused by aerobic and anaerobic spore-forming bacteria (e.g. botulism)
- Contact diseases – usually responsible for serious epidemic diseases in livestock in the tropics such as Rinderpest, Foot and Mouth disease etc
- Parasitic diseases – similar to contact diseases examples include haemonchosis, fascioliasis etc.
- Nutritional and metabolic diseases

4.0 CONCLUSION

In this unit you have learnt that diseases are caused by several factors ranging from microbial pathogens to poor nutrition. Diseases are either infectious or noninfectious depending on the cause and their ability to spread. You have also learnt that diseases can be transmitted through contact, vectors or inanimate vehicles. This unit also described the basis of classification of diseases such as the causative organism, the species of livestock and the system of the body affected.

5.0 SUMMARY

This unit discussed the general causes of diseases in livestock and how diseases are transmitted from one animal to the other. The various basis of disease classification were also explained using examples.

6.0 TUTOR MARKED ASSIGNMENTS

1. State three ways in which diseases can be transmitted
2. Using the etiology or causative organism give three classes of livestock Diseases.

7.0 REFERENCES/FURTHER READING

Radostits, O.M., Gay, C.C., Blood, D.C., and Hinchcliff, K.W., 2000. Veterinary Medicine. A Textbook of the Diseases of Cattle, Sheep, Pigs, Goats and Horses, 9th Ed. W.B. Saunders, Philadelphia

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UNIT 4 PRINCIPLES OF ANIMAL IMMUNITY

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main content
 - 3.1 Types of Immunity
 - 3.2 The Immune System
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Reading

1.0 INTRODUCTION

Animals are constantly exposed to a variety of disease-causing agents or pathogens. When these pathogens enter the body and are able to colonize the host and multiply, they cause disease. An animal's immune or defense system is that part of the body which acts to counteract any infectious agent that is introduced into the body. This defense system of the body can be said to comprise of three parts namely; the layered defense (skin and mucus), the innate or natural immunity which is nonspecific and the adaptive immunity.

2.0 OBJECTIVES

At the end of this unit, you should be able to: Explain what immunity in animals is
Describe the basic types of immune responses in animals.

3.0 MAIN CONTENT

3.1 Types of Immunity

Immunity can be classed as either natural or acquired. Natural immunity is an innate or inborn ability to resist certain types of diseases and this immunity does not involve production of antibodies. Acquired immunity on the other hand is immunity that animal develops to resist specific infectious agents either passively or actively. Passive immunity involves the transfer of pre-formed antibodies from an immune animal to a susceptible animal to provide protection against a pathogen as obtained when a calf suckles the dam soon after calving or by injection of antiserum into another animal. This type of immunity last for a short period. Active immunity is obtained when animal develops antibodies following exposure to an infectious agent or pathogen either natural infection or by vaccination. This type of immunity last longer in the animal.

The Immune System

The function of the immune system of the animal is to protect the body against pathogenic agents. The immune of the animal is innate and is composed of two parts, humoral and Cellular. The humoral part produces substances like antibodies) found in the blood. These substances are able to prevent growth and development of pathogens or make them stick together to facilitate their removal from the body. The cellular part produces cells (like T-lymphocytes, Natural Killer cells) that ingest and destroy pathogens. Both the humoral and cellular immunity are not directed against particular pathogens and therefore are said to be nonspecific.

4.0 CONCLUSION

In this unit you have been introduced to what is immunity in animals and how an animal's body reacts to the presence of an infectious agent. You have also been exposed to the two different types of immune responses that occur in the body.

5.0 SUMMARY

This unit has discussed the basic concept of immunity in animals. The next unit will expose you to the methods used in the prevention, control and eradication of diseases. The basis for the use of each method to prevent, control or eradicate diseases will also be stressed.

6.0 TUTOR MARKED ASSIGNMENT

1. What do you understand by passive and active immunity?
2. How many parts can the immune system be divided into?
3. Name any two cell types produced by the immune system?

7.0 REFERENCES/FURTHER READING

Immunobiology-The Immune System in Health and Disease, 4-5th edition, eds. Janeway, Travers, Walport and Capra

Radostits, O.M., Gay, C.C., Blood, D.C., and Hinchcliff, K.W., 2000. Veterinary Medicine. A Textbook of the Diseases of Cattle, Sheep, Pigs, Goats and Horses, 9th Ed. W.B. Saunders, Philadelphia

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UNIT 5 PREVENTION AND CONTROL OF LIVESTOCK DISEASES

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- 3.0 Main content
 - 3.1 Types of Immunity
 - 3.2 The Immune System
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- 7.0 References/Further Reading

1.0 INTRODUCTION

Animal production can be improved by increase in animal number (herd size) and increase output per unit animal. In order to achieve this improvement, prevention and treatment of diseases must be complementary to other measures like adequate nutrition and good management practices. Prevention in this sense simply means avoidance of disease and control refers to reduction in disease incidence or prevalence. Eradication refers to complete removal of a disease from an area. Hygiene is actually preventive medicine and therefore used to prevent diseases. The number of animals that develop a disease within a particular time frame is known as incidence of the disease and this is a measure of the rate of spread. Prevalence of a disease refers to the number of animals that develop a disease at a specific time and this indicates how serious and how long the disease affects the population of animals. A disease that is constantly present in a population is said to be endemic. The general methods used for control of livestock diseases are usually aimed at prevention of disease occurrence, control of a disease that is already in existence and eradication of the disease from an area. The particular method applied in each circumstance is tailored to achieve a specific objective.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- Differentiate between the use of the words “Prevention, control and eradication” of diseases.
- Explain the methods used in prevention, control and eradication of livestock diseases in Nigeria.

3.0 MAIN CONTENT

3.1 Methods for Prevention

The two major methods used for prevention of livestock diseases is aimed stopping a disease from getting to a herd, flock or group of animals. These methods are quarantine and vaccination.

- **Quarantine** – This is physical separation of healthy animals from sick or new animals. Also, movements of items are restricted between the two groups of animals. All new animals to be added to a farm, flock or herd should be quarantined, tested and/or treated appropriately before introduction into the farm or herd. Where very strict quarantine is practiced, the herd is closed to live animals and artificial insemination is used.

- **Vaccination**

This method is used where exposure to a disease is likely and in the hope that vaccination will protect the animals if and when exposed. Vaccination is based on the principle of herd immunity and suppression of disease when individual animals are resistant. All animal are vaccinated using a suitable vaccine. A vaccine is a biological substance which stimulates the body's immune system to produce antibodies. Vaccination should be done as close as possible to the period of greatest risk of the animals to the disease being vaccinated against. Vaccination should not carried out during period of stress for the animals. Diseases commonly vaccinated against in Nigeria include Rinderpest, Anthrax, Contagious Bovine Pleuropneumonia (cattle), Fowl typhoid, Newcastle Disease, Fowl pox (poultry) and Rabies in dogs.

3.2 Methods for Control

The methods used control is aimed reducing the disease to a level that is tolerable or economically feasible. The goals for control are to decrease the prevalence of an existing disease, decrease the incidence of new infection and decrease the morbidity and mortality. These are achieved by identifying the infected animals or herd and this is followed by the following:

- **Treatment** – All infected animals are promptly treated with appropriate therapeutic agents. This method depends on the availability of cheap and safe drugs. Use of broad spectrum antibiotics and anthelmintics are useful in achieving mass treatment.
- **Sanitation** – Proper hygienic practices that will ensure and maintain a clean environment where animals are housed must be practiced. Clean water and proper feeding troughs should be provided as faecal contamination of feed and water are usually good sources of infection. For grazing animals, this will include roation of grazing areas.

3.3 Methods for Eradication

The aim of eradication is to eliminate a disease completely from a herd and/or geographical area. The methods generally applied to achieve eradication of diseases are:

- Depopulation – This method is used normally when other means are not likely to achieve the desired result and when the disease in question will have a devastating consequence. It is used to completely stamp out a disease. It requires that all animals or species concerned in a particular area or farm be killed or destroyed. The destruction can be total or limited. The method works best developing countries like Nigeria when implementation is compulsory and is initiated and supervised by the government with compensation of the affected farmers.

Where limited destruction of animals is to be applied, it is preceded by testing to identify affected animals to be destroyed. This is known as “test and slaughter” or “test and removal.” This method relies on the use of sensitive diagnostic tests to identify animals to be removed and the economic costs of the removal.

4.0 CONCLUSION

In this unit you have been introduced to the difference between the use of the words prevention, control and eradication as used in preventive medicine. Also, the different methods used to prevent, control and eradicate livestock diseases were also explained in this unit. A major factor that contributes to successful disease control programmes is surveillance. It is only through surveillance that the presence or absence of diseases can be confirmed.

5.0 SUMMARY

This unit has discussed the basic methods used in the prevention, control and eradication of diseases. The basis for the use of each method to prevent, control or eradicate diseases has also been stressed. The next unit will expose you to the common diseases of livestock in Nigeria and how the methods described are used in relation to their control.

6.0 TUTOR MARKED ASSIGNMENT

- 1 In your own words differentiate between incidence and prevalence of a disease
- 2 What do you understand by the word “quarantine” as used in prevention of animal diseases?
- 3 List the methods used control of livestock diseases

7.0 REFERENCES/FURTHER READING

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MODULE 2 COMMON DISEASES OF LIVESTOCK IN NIGERIA AND THEIR CAUSES

This module gives a summary of selected important diseases of ruminants and other livestock in Nigeria. These selected diseases are discussed as examples of those that seriously affect the productivity of livestock especially ruminants in Nigeria and therefore not exhaustive. Carefully go through each unit presented below.

Unit 1	Bacterial diseases
Unit 2	Viral diseases
Unit 3	Parasitic diseases
Unit 4	Metabolic/Nutritional diseases
Unit 5	Plant poisoning

UNIT 1 BACTERIAL DISEASES

CONTENTS

1.0	Introduction
2.0	Objectives
3.0	Main Content
3.1	Anthrax
3.2	Brucellosis
3.3	Bovine Tuberculosis
3.4	Blackquarter
3.5	Foot Rot
3.6	Contagious Bovine Pleuropneumonia and Contagious Caprine Pleuropneumonia
3.7	Dermatophilosis
3.8	Other Bacterial Diseases
4.0	Conclusion
5.0	Summary
6.0	Tutor-Marked Assignment
7.0	References/Further Reading

1.0 INTRODUCTION

Bacterial diseases are those diseases caused by pathogenic bacteria which invade and multiply within the animal's body. Some these bacterial diseases are very serious and some are can spread from animals to man. Some harmful bacteria also produce toxins which can be very injurious to the health of both animals and man. However, not all bacteria are harmful as some are inhabit the body of animals normally and these are said to be non-pathogenic.

2.0 OBJECTIVES

At the end of this unit, you will be able to:

- List important bacterial diseases of ruminants
- describe the symptoms or clinical signs of the bacterial diseases
- State the methods of transmission of these diseases and the methods of prevention or control

3.9 MAIN CONTENT

3.10 Anthrax

Anthrax also known as Splenic fever is a rapid and highly fatal infectious diseases of cattle, sheep, goat and horses caused by aerobic gram positive, spore-forming bacteria. The spores can remain in the soil for long periods of over 30 years and become active when conditions are favourable. This disease affects most mammals including humans. Ruminants ingest the bacteria or the spore during grazing or through open wounds in the mouth. Biting insects can also transfer the disease from one animal to another. Symptoms include high fever, sudden staggering, hard breathing, severe bloody diarrhea, bloody nasal discharge and death within a few hours. Prevention of Anthrax is annual vaccination in endemic areas. Anthrax is a zoonotic disease and because of its highly fatal nature, postmortem is not recommended. Carcasses of animals suspected to have died from Anthrax should be burnt in an enclosed area or buried at the depth of six feet and covered with quicklime. Treatment is not recommended large doses of serum against Anthrax should be quickly given followed by high doses of antibiotic of choice such as Penicillin or Erythromycin can be given.

3.11 Brucellosis

This disease also called Bang's disease or Contagious abortion usually results in heavy economic losses. This disease in cattle and man is caused by the bacteria *Brucella abortus*, in goats, ruminants, *Brucella melitensis*, in sheep, *Brucella ovis*, in pigs *Brucella suis* and in dogs, *Brucella canis*. The disease is spread by bringing an infected animal into a herd, contact with aborted fetuses, contact with contaminated feed/water or sniffing or licking of aborted fetuses or calf from infected cow. Symptoms of this disease include abortion in the last three months of pregnancy, retained placenta, weak or dead calf at birth and inflammation of the knee (hygroma). This disease can cause sterility in bulls and cows. There is no treatment for this disease and prevention is advocated and this attained by good herd management. This is also a zoonotic disease.

3.12 Bovine Tuberculosis

This is a major zoonotic disease that can be transmitted to man. It is an infectious contagious highly debilitating disease caused *Mycobacterium bovis* and sometimes

Mycobacterium tuberculosis. Symptoms include frequent coughing and emaciation. The disease is mostly detected at slaughter during meat inspection. This disease is not treated in affected animals but eliminated and all materials in contact with the affected animal must be disinfected.

3.13 **Blackquarter**

This disease is an infectious disease of mostly cattle and sheep characterized by emphysematous swelling in heavy muscles caused by anaerobic spore-forming bacteria known as *Clostridium chauvoei*. The bacterial spores commonly enter the body through the mouth and wounds. The signs include lameness, swollen muscles, severe depression, high fever in the early stages and the affected animals may be unable to stand. One or more animals in the herd may die suddenly. This disease commonly affects calves. Treatment is achieved with massive doses of antibiotics and this can be effective provided diagnosis is done in the early stages of the disease. This disease can be prevented mainly by vaccination and proper disposal of dead animals by burning or burial.

3.14 **Foot Rot**

This is an infectious disease of ruminants caused mostly by the bacteria *Dichelobacter nodosus* (*Fusobacterium necrophorum*) resulting in lameness, elevated temperature, loss of appetite and weight loss. Injury to the interdigital skin provides source of entry for the infection. The condition can be complicated by other opportunistic microorganisms like fungi found in manure-filled and muddy areas where ruminants are kept especially in feedlots. Prevention of this disease can be achieved by good sanitation and good drainage of the area where animals are kept. Also, efforts should be made to ensure that manure does not accumulate around drinking and feeding points. Treatment of foot rot is achieved by the use of antibiotics like Penicillin and Sulfa drugs.

3.15 **Contagious Bovine Pleuropneumonia and Contagious Caprine Pleuropneumonia**

Contagious Bovine Pleuropneumonia (CBPP) is a severe and highly infectious disease of cattle caused by *Mycoplasma mycoides* while Contagious Caprine Pleuropneumonia (CCPP) is an acute highly contagious disease of goats caused by *Mycoplasma mycoides* subspecies *capri*. These two diseases are characterized by fever and affect the lungs. In cattle, CBPP signs include coughing, open-mouthed breathing, loss of appetite, rumination disorders and weakness. Prevention of CBPP is done through vaccination and systematic slaughter of infected and carrier animals following serological tests. This condition can however, be confused with bovine tuberculosis in cattle. Goats affected by CCPP show labored breathing and may even bleat or grunt due to pain. Prevention is by vaccination and the use of antibiotics like Tylosin has been shown to be effective for goats.

3.16 Dermatophilosis

Dermatophilosis also known as “Kirchi” in Nigeria is contagious infectious skin disease of ruminants especially cattle. This skin condition which also affects horses and humans is caused by the bacteria, *Dermatophilus congolensis*. It is characterized by crusted plaques on the skin of the affected animals. There is weight loss in affected animals and drop in milk yield (if they are lactating). The condition is more common during the rainy season. Predisposing conditions include injury to the skin and the presence of tick and biting flies. The condition is treated with the use of appropriate antibiotics.

3.17 Other Bacterial Diseases

There are several other bacterial diseases that affect ruminants. These include Mastitis, Salmonellosis, Tetanus, Botulism Pasteurellosis, Haemorrhagic septicaemia among others. The list of these diseases is not exhaustive.

4.0 CONCLUSION

In this unit, we have discussed some bacterial diseases that affect ruminants and consequently, will affect their productivity. We have also seen that some of these diseases can be transferred from animals to man (zoonotic). Preventive and/or control measures for these diseases have also been mentioned.

5.0 SUMMARY

In this unit, you have learnt that:

Important bacterial diseases that affect ruminants include Anthrax, Brucellosis, Bovine tuberculosis, Blackquarter, Foot rot, Contagious bovine pleuropneumonia, Contagious caprine pleuropneumonia, Dermatophytosis among others.

6.0 TUTOR-MARKED ASSIGNMENT

- 1 Briefly describe the symptom or signs seen in cattle affected by (a) Anthrax
- 2 (b) Contagious bovine pleuropneumonia (c) Dermatophytosis
- 3 List three bacterial diseases that can be transferred from infected animals to man.
- 4 Explain the preventive and control measures that should be taken once an animal has died of Anthrax on a farm

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UNIT 2 VIRAL DISEASES**CONTENTS**

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Rinderpest
 - 3.2 Foot and Mouth Disease (FMD)
 - 3.3 Peste des Petits Ruminants (PPR)
 - 3.4 Other Viral Diseases
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Reading

1.0 INTRODUCTION

Viral diseases are caused by viruses which invade and replicate inside cells within the animal's body. Some of the viral diseases affecting ruminants can be very devastating and spread easily from animal to animal. Most viral diseases affecting ruminants are better controlled by vaccination rather than treatment.

2.0 OBJECTIVES

At the end of this unit, you will be able to:

1. List important viral diseases of ruminants
2. Describe the symptoms or clinical signs of these viral diseases
3. State the methods of transmission of these diseases and the methods of prevention or control

3.0 MAIN CONTENT**3.1 Rinderpest**

This is contagious viral disease of cattle, buffaloes, sheep and goats characterized by fever, oral erosions, serous to mucopurulent nasal and ocular discharge, diarrhea and high mortality. It is caused by a Morbillivirus of the Paramyxoviridae family. This disease occurs as epidemics and is transmitted by close contact between infected and non-infected animals through inhalation or ingestion of contaminated feed, water, nasal discharges etc. The virus is normally present in the blood, tissues, secretions and excretions of an infected animal. Treatment of this disease is not recommended. This disease can also be confused with Foot and Mouth Disease and Bovine Viral Diarrhoea. Prevention and control of this disease is by quarantine, slaughter of infected animals and proper disposal of carcasses followed disinfection.

3.2 Foot and Mouth Disease (FMD)

Foot and Mouth Disease is severe highly contagious viral disease of cattle, sheep, goats, buffaloes and pigs caused by a virus with seven serotypes. The symptoms or signs include fever, formation of vesicles on the teat, tongue, lameness, weight loss, and excessive salivation. This disease is spread by contact between infected and non-infected animals, contact with materials from infected animals and by inhalation as infected animals carry large amounts of aerosol virus in their exhaled air. There is no definitive treatment for FMD and infected animals are recommended for culling after recovery. This disease is controlled by vaccination.

However, the vaccines to be used must protect the animals against the serotypes causing disease in the specified area.

3.3 Peste des Petits Ruminants (PPR)

Peste des Petits Ruminants (PPR) is a fast spreading severe viral disease of sheep and goats caused by a Morbillivirus of the Paramyxovirus family. PPR is characterized by high fever, weakness, oral lesions, cough, foul-smelling diarrhea, discharge from the eyes, nose and difficult breathing. PPR is transmitted by aerosol and all secretions and excretions from sick animals contain the virus. This disease does not have a specific treatment but complications by bacteria and other parasites can be treated to reduce mortality. Prevention is achieved by the use of vaccination.

3.4 Other Viral Diseases

There are other viral diseases that affect ruminants. These include Lumpy Skin Disease, Sheep and Goat Pox and Keratoconjunctivitis.

4.0 CONCLUSION

In this unit, we have talked about some important viral diseases that affect the productivity of ruminants. We have also been told the mode of transmission of these diseases and how they can be prevented or controlled.

5.0 SUMMARY

In this unit, you have learnt:

- Three important viral diseases of ruminants and these are Rinderpest, Foot and Mouth disease and Peste des Petits Ruminants.
- The method of transmission and control of these three diseases.

6.0 TUTOR-MARKED ASSIGNMENT

1. Briefly describe the symptom or signs seen in ruminants affected by (a) Rinderpest (b) Foot and Mouth disease (c) Peste des Petits Ruminants.
2. Name two diseases that can be confused with Rinderpest?

7.0 REFERENCES/FURTHER READING

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UNIT 3 PARASITIC DISEASES

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Protozoan Diseases
 - 3.1.1 Trypanosomosis
 - 3.1.2 Babesiosis
 - 3.1.3 Coccidiosis
 - 3.1.4 Theileriosis (East Coast Fever)
 - 3.1.5 Other Protozoan Diseases
 - 3.2 Rickettsial Diseases
 - 3.2.1 Anaplasmosis
 - 3.2.2 Heartwater
 - 3.3 Diseases caused by Helminthes
 - 3.4 Diseases caused by External Parasites
 - 3.5 Control of Ectoparasites
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Reading

1.0 INTRODUCTION

Parasitic diseases are those diseases caused by parasites and a parasite is a small organism that lives on or in and at the expense of a larger organism called a host. The parasite benefits from the relationship while the host suffers. The parasites that cause diseases in ruminants include those that are found in the blood (Protozoan and Rickettsial parasites), digestive system (helminthes) and on the skin (ticks, mites, flies and lice).

2.0 OBJECTIVES

At the end of this unit, you will be able to:

- List important parasitic diseases of ruminants
- Identify those parasites that cause disease.
- Identify which parasites transmits another disease causing agent
- Describe how parasites diseases are prevented/controlled

3.0 MAIN CONTENT

3.1 Protozoan Diseases

3.1.1 Trypanosomosis

Animal Trypanosomosis is a severe parasitic disease affecting cattle, sheep, goats, camels, antelopes, dogs and humans. The disease is caused by different species of Trypanosomes which are transmitted by biting flies (tse tse flies or Glossina). The disease is characterized by intermittent fever, anaemia, loss of condition and death. The species that cause disease include *T. brucei brucei* (Cattle, sheep, goats, camel), *T. brucei evansi* (Cattle, goats, camel), *T. congolense* (Cattle, sheep, goats, camel), *T. vivax* (Cattle, sheep, goats, camel), *T. theileri* (Cattle T. simiae (Sheep, goats, camel) and *T. melophagium* (Sheep and goats). The disease can occur in acute, subacute, or chronic form. Diagnosis is usually based on demonstration of trypanosomes in blood smears. However, more specific test such as Indirect fluorescent antibody test (IFA) and the enzyme-linked immunospecific assay (ELISA) test are used for diagnosis. Treatment is by use of trypanocidal drugs such as Diminazene aceturate, Homidium bromide etc. Vector control can help to control or prevent trypanosomosis.

3.1.2 Babesiosis

Babesiosis also known as piroplasmosis, redwater, tick fever is tick-borne disease of ruminants characterised by fever, anemia, haemoglobinuria (reddish dark-brown urine) and weakness. In cattle, the disease is caused *B. bigemina* and *B. bovis* which are transmitted by ticks (*Boophilus* species). In sheep and goats the disease is associated with *B. ovis* and *B. motasi* which is transmitted by ticks of the genus *Haemaphysalis* and *Rhipicephalus*. Diagnosis is based on demonstration of Babesia parasites in blood smears. Control of the disease is by proper tick control and quarantine. Animals should be routinely treated with acaricides. Tick vaccines are also available in addition to acaricides.

3.1.3 Coccidiosis

Coccidiosis is a serious disease affecting mainly young animals (calves, lambs and kids) causing important economic losses. Coccidiosis in sheep and goats is caused by protozoa of the genus *Eimeria* (*E. parva*, *E. arloingi*, etc) and is characterized by diarrhea which can be bloody or mucoid, anorexia, tenesmus (straining) and weight loss. The temperature may be normal. Diagnosis is based on history, clinical and necropsy findings, and microscopic examination of feces. Treatment is by the use of drugs (coccidiostats) and usually all animal in the herd or flock is treated. Preventive measures include good hygienic practices such as removal of animal manure, avoiding overcrowding of animals and pasture management to control parasites.

3.1.4 Theileriosis (East Coast Fever)

Theileriosis is a haemoparasitic disease of cattle, goats, and sheep caused by the protozoan parasite of the genus *Theileria* and transmitted by ticks. In cattle the disease is caused by *Theileria parva*, *T. mutans*, *T. velifera*, *T. taurotragi*. and transmitted by the tick,. In sheep and goats the causative parasite is *T. ovis* and *T. hirci*. The tick vectors of this disease are *Rhipicephalus ap- pendiculatus* *Amblyomma variegatum*, *Haemaphysalis* spp. Affected animals show anorexia, decreased milk production, loses condition, ceases rumination, rapid heartbeat petechial haemorrhages under the tongue and on the vulva. Diagnosis is by demonstration of parasites in blood and schizonts in lymphocytes. The disease is controlled by good hygiene and used of appropriate drugs for treatment.

3.1.5 Other Protozoan Diseases

There are several other protozoan diseases that affect ruminants. These include Toxoplasmosis, Cryptosporidiosis, Besnoitiosis, Neosporosis, Giardiasis and Sarcocytosis.

3.2 Rickettsial Diseases

3.2.2 Anaplasmosis

This is an infectious disease of cattle, sheep and goats caused by intraerythrocytic parasites of the genus *Anaplasma*. The disease is characterized by fever, depression, progressive anaemia, inappetance, labored breathing, jaundice, constipation, abortion and death. In cattle the disease is caused *Anaplasma marginale* which is transmitted by tick (*Dermacentor* species) and *A. bovis* which is carried by *Hyalomma* species of ticks. In sheep and goats, the *A. marginale* is transmitted by *Dermacentor* species of ticks. Control measures are keeping tick vectors off the animals and use of vaccination.

3.2.3 Heartwater

This is a noncontagious infectious disease of cattle, sheep and goats caused by the previously thought rickettsial organism now a bacterium *Ehrlichia ruminantium* (formerly called *Cowdria ruminantium*). The disease is transmitted by the ticks of the genus *Amblyomma variegatum*. The symptoms of the disease include chewing movements, protrusion of the tongue, twitching of eyelids and circling. Neurologic signs become apparent as the disease progresses and the animal can go into convulsions, lateral recumbency with paddling movements, twisting of the neck (opisthotonos) and frothing at the mouth. Prevention is by tick control and vaccination.

3.3 Diseases caused by Helminthes

Helminthes, otherwise known as worms are mostly endoparasites though some live externally. The helminthes that cause disease in ruminants are round worms (Nematodes), flukes (Trematodes) and tapeworms (Cestodes). The deleterious effect of diseases caused by helminthes on ruminants depends on the type of helminthes, location within the host, degree of parasitism and the nutritional status of the animal. The major diseases in ruminants caused by helminthes are Haemonchosis and Fasciolosis. Haemonchosis is caused by the nematode, *Haemonchus contortus* is characterized by weakness, pale mucous membrane and inflamed mandibular region (bottle jaw). Fasciolosis on the other hand is caused by *Fasciola gigantica* and *Fasciola hepatica* and is characterized by weakness, pale mucous membrane, enlargement of the liver and abdominal distension. In addition to these other species of helminthes which cause disease in ruminants are Paramphistomum, Bunostomum, Oesophagostomum and Trichostrongyloids among others. Diagnosis is usually based demonstration of eggs, larvae or adult in appropriate samples from affected animals depending on the helminth in question. Samples usually collected from sick animals include faeces, blood, sputum, urine, lacrimal fluid and skin snips depending on the helminth in question. Prevention helminthosis is by proper grazing management and use of resistant animals. Treatment is achieved by the use of appropriate anthelmintics for deworming.

3.4 Diseases caused by External Parasites

The ectoparasites cause diseases in ruminants either by serving as vectors or transmitters of other disease-causing agents, by feeding on blood or cells of the host animal or by secreting toxins in their saliva. Ectoparasites also constitute a biting nuisance in ruminants and distract animals from feeding thereby affecting productivity. These ectoparasites are ticks, mites, lice, fleas and flies. A major disease is Mange, which is caused by several species of mites (Sarcoptes, Psoroptes, chrioptes and Demodex), Tick paralysis is also another disease caused by Ixodes species while severe anaemia in the young can be caused by flea and lice infestation.

3.5 Control of Ectoparasites

Control of ectoparasites is achieved by use of appropriate insecticides to spray the pens and immediate surroundings of where ruminants are kept. Regular spraying of animal sheds, pens etc with appropriate insecticides is a good management practice. It is also necessary to regularly clean animal pens in addition to raking and burning of infested litter where ectoparasites are resident. However, care must be taken when doing this to avoid uncontrolled fire outbreak. Treatment of animals with ectoparasite infestation include, dipping animals or spraying animals with appropriate acaricides and the use of formulations which are used as pour-on. Use of insecticide impregnated eartags is also another method of control of ectoparasites in ruminants. Chemotherapy as a means of control involves the use systemic drugs like Ivermectin, Doramectin etc. The specific control measure applied will depend on the ruminant species, resources available and the purpose for which they are kept.

4.0 CONCLUSION

In this unit, we have discussed selected protozoan, rickettsial and helminthic diseases as well as diseases caused by external parasites that affect ruminants and in Nigeria. We have also seen that most of these are transmitted by a vector, ticks and it is therefore important to keep animals free of parasites. Preventive and/or control measures for these diseases have also been mentioned.

5.0 SUMMARY

In this unit, you have learnt the:

- Important protozoan diseases that affect ruminants include Trypanosomosis, Babesiosis, Coccidiosis, and Theileriosis among others.
- Important rickettsial diseases that affect ruminants include Anaplasmosis and Heartwater.
- That helminthes cause disease in ruminants and two of the diseases are Haemonchosis and Fasciolosis
- That external parasites such as are ticks, mites, lice, fleas and flies also cause problems in ruminants
- Methods used to control ectoparasites in ruminants

6.0 TUTOR-MARKED ASSIGNMENT

1. Name three protozoan parasites that cause trypanosomosis in cattle.
2. Name the tick vector responsible for transmission of the parasites that cause Theiliosis.
3. Explain the basis of diagnosis of coccidiosis.
4. Name two important diseases of ruminants caused by helminthes
5. Name two ectoparasites of ruminants and state two methods of controlling ectoparasites in ruminants

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UNIT 4 METABOLIC AND NUTRITIONAL DISEASES

CONTENTS

1.0 INTRODUCTION

Metabolic diseases are non-infectious conditions and result from a disturbance in metabolism or metabolic processes in the animal rather than under-nutrition or deficiencies. Nutritional diseases on the other hand are also non-infectious but may result from malnutrition or under-nutrition. Where they are metabolic or nutritional, these conditions do affect the productivity of ruminants and some can be fatal and therefore deserves proper attention by the livestock farmer.

2.0 OBJECTIVES

At the end of this unit, you will be able to:

- Discuss some metabolic diseases of ruminants
- Identify the cause of some metabolic diseases of ruminants
- Distinguish between malnutrition and under-nutrition as used ruminants feeding

3.0 MAIN CONTENT

3.1 Metabolic diseases

3.1.2 Bloat (Tympany)

This is a condition characterised by a distension of the rumen and reticulum in ruminants with gas (mostly carbon dioxide and methane) resulting from overfeeding with grains and some types of legumes/pastures. This type of bloat is primary bloat or frothy bloat. Bloat can also result from an obstruction in the rumen or interference with the mechanism of eructation. This type of bloat is secondary or free gas bloat. Normally, gas from metabolic activities is expelled through the blood stream to the lungs and removed by eructation or belching. If this is prevented from happening, the resulting distension or bloat puts pressure on the diaphragm and can result in death either due to asphyxiation or shock. Symptoms of this condition are ruminal distension, discomfort or uneasiness, difficult breathing and even sudden death. Preventive measures involve avoiding overfeeding of animals with cereals and spraying suspected pastures with oils. Treatment can be done by administration of anti-foaming agents, use of stomach tubes to expel the gas, trocharization and rumenotomy. However, treatment must be carried out by a trained personnel preferably a veterinarian.

3.1.3 Pregnancy Toxaemia (Ketosis)

Pregnancy toxaemia is an acute metabolic disorder of ruminants. Even though it is essentially a hypocalcaemic condition characterized by accumulation of ketone bodies in the blood, it has its roots in the abnormal metabolism of carbohydrates and fats, which occurs at the final stage of pregnancy. This condition occurs late in pregnancy or soon after calving, lambing or kidding and in early lactation. This condition is common with twin pregnancies or large single lambs. More specifically, this disease is due to a lack of glucose as an energy source, either from poor nutrition, excessive demand from multiple fetuses, or a combination of the two. Symptoms vary with individual animals but they include anorexia, depression, recumbency and death may follow. Treatment is usually aimed at correcting the energy deficiency, the electrolyte imbalance and re-hydration. Pregnant animals must be adequately fed and given proper hygienic practices.

3.1.4 Parturient Paresis (Milk fever)

This is a condition that occurs in ruminants just before or after parturition. This occurs as a result of insufficient calcium in the diet of the pregnant animal to meet foetal needs or milk production soon after parturition. This condition is more common in ewes since ewes' milk contain more calcium than that of the cow. The symptoms are weakness, stiff gait, hyperactivity and lateral recumbency. The condition can be prevented by ensuring that pregnant animals receive adequate amounts of calcium in the diet. Treatment is by intravenous administration calcium.

3.2 Nutritional Diseases

In order to achieve maximum production from ruminant animals, they must be provided with adequate nutrients and these include proteins, carbohydrates, lipids, vitamins, minerals and water. In practical terms, nutrition can be inadequate, either through being insufficient (undernutrition) or inappropriately balanced in relation to the animal needs (malnutrition). It is also possible to have situations where ruminants receive too few nutrients that are incorrectly balanced. Nutritional diseases are basically deficiencies in nutrients. Deficiency diseases are important not only because they reduce productivity but because they can trigger off infectious diseases by causing reduced resistance, or providing the basis of pica that drives ruminants to come in contact with soil borne infections. Examples of these deficiencies include, copper, Sodium, Iron and vitamins.

4.0 CONCLUSION

In this unit, we have discussed some important metabolic and nutritional diseases of ruminants and in Nigeria. We have also seen that it is important to feed animals adequately to prevent them from coming down with nutritional or metabolic diseases and produce maximally.

5.0 SUMMARY

In this unit, you have learnt that:

- Bloat, pregnancy toxemia and parturient paresis are three important metabolic diseases that affect ruminants.
- Nutritional deficiencies can result from malnutrition and undernutrition

6.0 TUTOR-MARKED ASSIGNMENT

1. Define or explain the condition known as bloat in ruminants.
2. List three symptoms you will expect to see in an ewe suffering from pregnancy toxemia.
3. Explain what you understand by malnutrition and undernutrition

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UNIT 5 PLANT POISONING

CONTENTS

1.0 INTRODUCTION

Some plants contain toxic substances that are harmful to ruminants. Plants that contain toxic substances in high amounts are poisonous plants. These toxins that present in these plants cause injuries to ruminant animals when grazed. These poisonous plants can be found anywhere ruminants graze. The part of the plant eaten, the quantity eaten, age of the plant and the season of the year are factors that determine how severe the poisoning will be.

2.0 OBJECTIVES

At the end of this unit, you will be able to:

- Explain why plant poisoning occur in ruminants
- List common symptoms of plant poisoning in ruminants
- List some common plants that are poisonous to ruminants

3.0 MAIN CONTENT

3.1 Why ruminants consume poisonous plants

Most cases of plant poisoning in ruminants occur during the dry season when pasture is limited or when areas available for grazing is reduced as occurs in some farming communities. Ruminants may also consume poisonous plants when their ration is unbalanced and therefore crave for nutrients that are absent from the ration. Grazing ruminants in overgrazed areas can expose animals to eating poisonous plants that they normally would not eat due to shortage of pasture.

3.2 Symptoms of poisoning

The symptoms of plant poisoning depend on the toxic substance in the plant consumed. However, symptoms that common to most conditions are profuse salivation, abdominal pain or colic, bloat or other forms severe digestive discomfort and even sudden death.

3.3 Common poisonous plants in Nigeria

Common poisonous plants in Nigeria that can be grazed by ruminants include but not limited to *Calotropis procera*, *Erythrophleum Africana*, *Lasiosyphon krausi*, *Ipomea asarifolia*, *Sorghum bicolar*, *Cassia occidentallis*, *Jatropha ncurcas*, *Mannihot esculenta*, *Cassia tora*, *Balanites aegyptica*, *Prosopis obloga*. The toxic components of these plants include toxic nitrates, oxalate, fluoroacetate, selenium, etc. Sometimes poisonous plants are mistakenly baled into hay.

3.4 Other sources of poisoning to ruminants Metabolic diseases

Other sources of poisoning do occur when ruminants graze pastures or plants on which herbicides or pesticides have been sprayed. In Nigeria most of these herbicides or pesticides contain organophosphates. Poisoning can also occur by ingestion of acaricides used for control of ectoparasites especially when it wrongly constituted or if expired acaricides are used.

3.5 Prevention/Treatment

Ruminants should be allowed to graze in areas with poisoning plants. It is necessary to identify poisonous plants in areas grazed by ruminants. Once a ruminant is suspected to have grazed a poisonous plant, the animal should be isolated, given fresh water the animal and stress should be avoided. Sample of the grazed or consumed material should be kept and the veterinarian called for prompt action. It should be noted that younger animals are more susceptible to poisoning than older animals.

4.0 CONCLUSION

In this unit, we have discussed why ruminants consume poisonous plants, the general symptoms of plant poisoning, sources of ruminant poisoning and what the farmer should do when a case of plant poisoning is suspected. We also named some common poisonous plants in Nigeria.

5.0 SUMMARY

In this unit, you have learnt that:

- Plant poisoning occurs when pasture availability is poor or when ration is deficient in some nutrients.
- Give two reasons responsible for plant poisoning in ruminants.
- Poisoning can also occur from grazing of pastures or crops sprayed with herbicides and pesticides as well as ingestion of wrongly constituted or expired acaricides used for ectoparasite control.

6.0 TUTOR-MARKED ASSIGNMENT

1. Define or explain the condition known as bloat in ruminants.
2. List five common poisonous plants in Nigeria.
3. Explain what you understand by malnutrition and undernutrition

7.0 REFERENCES/FURTHER READING

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MODULE 3 IMPACT OF LIVESTOCK DISEASES AND TREATMENT IN NIGERIA

This module discusses the impact of diseases on the livestock industry and as well as the public health significance of zoonoses. The module also reviews the treatment of livestock using conventional drugs and the potential of ethnoveterinary practices (indigenous knowledge) in treatment.

- Unit 1 Impact of livestock diseases on the Nigerian livestock industry
- Unit 2 Zoonoses and Public health significance of livestock diseases
- Unit 3 Treatment of livestock diseases

UNIT 1 IMPACT OF LIVESTOCK DISEASES ON THE NIGERIAN LIVESTOCK INDUSTRY

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 General effect diseases on productivity
 - 3.2 Reduction in Feed intake and utilization
 - 3.3 Pathophysiological damage
 - 3.4 Reduced productivity due to subclinical conditions
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Reading

1.0 INTRODUCTION

Livestock diseases and/or parasites constitute a serious impediment to animal productivity in Nigeria. Disease sharply reduces productivity of livestock especially ruminants across the different agroecological zones and production systems in Nigeria. The extent to which a particular disease affects livestock productivity depends on the disease in question, the level of nourishment of the animals and the type of production system.

2.0 OBJECTIVES

After going through this unit, you should be able to:

- Explain how livestock diseases reduces productivity
- State the different ways in which diseases affect productivity

3.1 MAIN CONTENT

3.1 General effect diseases on productivity

Diseases generally reduce productivity in ruminants or on any livestock farm. The losses in productivity manifest in several ways. In ruminants, these include poor weight gain, reduced milk yield, poor feed conversion, poor reproductive capacity, abortion, low birth weight, reduced work capacity (in draught animals) and even death.

3.2 Reduction in Feed intake and utilization

Ruminants and animals generally go off feed when they come down with a disease and therefore their performance or productivity is reduced. Some diseases on the other hand affect metabolic processes and consequently reduce feed utilisation. Furthermore, a reduction in feed intake and utilization can influence the course of a disease. It is generally accepted that malnourished and undernourished animals are poor in withstanding diseases and/or parasites. Some Parasites causing diseases such as helminthes also utilize nutrients from digestion meant for the host animal therefore further compounding the problem.

3.3 Pathophysiological damage

Diseases and parasites cause significant pathophysiological damage to host organs/cells and some these pathologies can be extensive. Diseases caused by parasites in the blood such as babe- sia and trypanosome species cause destruction of red blood cells resulting in anaemia. Some helminthes like trichostrongylus (4th stage larvae) cause rapid decline in packed cell volume (PCV) and injury to the abomasal glands. In some ectoparasite conditions, extensive damage to the skin by ectoparasites can lead to a reduction in the quality of the hides and skin.

3.4 Reduced productivity due to subclinical conditions

An important aspect of effect of disease on productivity is the continuous economic impact of subclinical diseases or parasitism which is often inadequately quantified. Ruminants with sub- clinical conditions have reduced productivity but because these animals do show obvious clinical disease are rarely given attention but they cause serious economic losses. Diseases and parasites in ruminants must be controlled to achieve the much desired improvement in productivity.

4.0 CONCLUSION

In this unit, we have discussed the effects of diseases and parasites on livestock productivity. We have also seen how diseases cause their negative effects on livestock productivity and that disease and parasites of livestock must be controlled to achieve improved productivity.

5.0 SUMMARY

In this unit, you have learnt that:

- Diseases generally reduce productivity in ruminants and all livestock species.
- Diseases cause reduction in productivity through poor weight gain, reduced milk yield, poor feed conversion, poor reproductive capacity, abortion, low birth weight, reduced work capacity (in draught animals) and death..
- Subclinical diseases also reduce productivity by reducing performance.

6.0 TUTOR-MARKED ASSIGNMENT

List five ways through diseases reduces productivity of ruminants in Nigeria.

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UNIT 2 ZOOSES AND PUBLIC HEALTH SIGNIFICANCE OF LIVESTOCK DISEASES

CONTENTS

1.0 INTRODUCTION

Zoonoses refer to diseases that are shared between animals and humans or diseases that can be transmitted from animals to man. Zoonotic diseases are generally infectious and are therefore caused by viruses, bacteria, parasites, and fungi. Wildlife are a reservoir for some zoonotic diseases and serve as source of infection to grazing ruminants. Zoonotic diseases are common and its number constantly increases due to the discovery new diseases. Zoonotic diseases are worldwide and therefore are a threat to the health and welfare of the public.

2.0 OBJECTIVES

After going through this unit, you should be able to:

- Define or explain what is zoonoses
- State how zoonoses occurs
- List some important zoonotic diseases
- Explain the public health implications of zoonoses

3.0 MAIN CONTENT

3.1 Mode of Transmission of Zoonotic Diseases

Human beings generally acquire pathogens by coming in contact with animals and/or animal products through various ways. The routes of acquiring the pathogens are inhalation, ingestion and contact with damaged skin. Contact can be with the saliva, blood, urine, or feces of an infected animal or contaminated soil. Also bite from a mosquito or some other vector can also transmit the zoonoses. Consumption of raw or undercooked meat, unpasteurized milk or unwashed fruits and vegetables that are contaminated with faeces from an infected animal can also be a source of zoonoses. Certain professions like farm workers, abattoir workers, meat sellers, veterinarians, wildlife and biologists are at higher risk of contracting zoonoses due to exposure especially if unprotected. Because of these interactions, it is important to be aware of the different ways people can get zoonotic diseases. Some zoonotic diseases once acquired can also spread from person to person as was seen with the outbreak Ebola Viral disease in Africa in 2014. Some examples of zoonotic diseases from ruminants include tuberculosis, anthrax, dermatophilosis, babesiosis, foot and mouth disease, salmonellosis, Rabies and leptospirosis.

3.2 Prevention/Treatment

Prevention and/or treatment of zoonotic diseases in animals are similar as with non-zoonotic diseases. Vaccination, proper hygienic practices and use of appropriate drugs for chemotherapy will suffice. Isolation of the affected animals may also be necessary depending on the particular case to be handled. Elimination of the causative pathogens from animal reservoirs protects humans and good sanitary and hygienic with food processing and preparation are good ways of protecting humans from zoonoses.

3.3 Public health significance

Zoonotic diseases are a threat to public health across the world. The prevention, treatment and control of zoonoses place a serious burden on healthcare delivery especially in the developing countries with poor resources. With globalization, food production, international in agriculture and international trade are affected by zoonoses. Because many people come in contact with animals daily and food animals are raised close to homesteads, people must be aware of the various ways zoonotic diseases can be acquired

4.0 CONCLUSION

In this unit, we have defined zoonoses and discussed how zoonotic diseases are transmitted from animals to humans. We have also stated how zoonoses are prevented or treated and how humans can be protected from acquiring zoonoses. We have also been given some examples of zoonotic diseases that can be acquired from ruminant animals. The public health significance zoonoses has also been mentioned.

5.0 SUMMARY

In this unit, you have learnt that:

- 1 Zoonotic diseases are diseases transmitted from animals to man or common to animals and humans.
- 2 Humans can acquire zoonotic disease by bite of a tick or an insect vector, handling or eating undercooked or raw meat, or coming into contact with the blood, urine, or feces of an infected animal.
- 3 Zoonotic diseases can be prevented and/or treated by vaccination, proper hygienic practices and use of appropriate drugs for chemotherapy.

6.0 TUTOR-MARKED ASSIGNMENT

1. List three zoonotic diseases that can be human can acquire from ruminants
2. Explain three ways of transmission of zoonotic diseases from animals to humans.
3. State three ways that zoonotic diseases can be prevented from getting to humans

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UNIT 3 TREATMENT OF LIVESTOCK DISEASES

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Routes of drug administration in animals
 - 3.2 Veterinary Preparations
 - 3.3 Classes of selected veterinary drugs and examples
 - 3.4 Ethnoveterinary medicine/practices.
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Reading

1.0 INTRODUCTION

Treatment of sick animals is carried out only after a diagnosis has been made of the condition affecting the animal. Treatment can be the application of drugs or biological substance and/or surgical intervention to ameliorate or prevent a specific ailment or condition. When treatment is required, care should be taken to select the appropriate drug, dose, frequency of administration, route of administration and the form in which the drug appears in order to achieve the desired result. The choice of treatment especially for food animals like ruminants should take into account public health, environmental or regulatory concerns. Treatment is done usually using carried with orthodox (Western) conventional drugs and in some cases indigenous knowledge based practices now known as Ethnoveterinary medicine or practices.

2.0 OBJECTIVES

After going through this unit, you should be able to:

- List the routes of administration of drugs in animals
- List the forms or formulation in which veterinary drugs appear
- List the classes of drugs used in animals
- Explain what ethoveterinary medicine or practice

3.0 MAIN CONTENT

3.1 Routes of drug administration in animals

Several routes are used for the administration of veterinary drugs. The choice of route and the technique of administration is based on a number of factors which include the species of animal, the physicochemical properties of the drug, the formulation and the disease in question. However, the recommendations of the manufacturer should always be followed.

i. Oral

This is administration of drugs through the oral cavity or mouth and it is a natural route for drug administration. This route is suitable for drugs like antidiarrheals, anthelmintics, supplements etc. When using this route, care must be taken to avoid drugs getting into the trachea. Drugs administered through this route are however, exposed to the action digestive enzymes and microorganisms that inhabit the digestive tract may affect the drug activity. Also, onset of drug action may be slower when compared with other routes. Administration of drugs in feed and water is also through the oral route. Drug formulations or preparations administered using the oral route are tablets, boluses, suspensions, syrups and the like.

ii. Parenteral

This route of drug administration involves using a hypodermic needle and syringe to introduce the medication between the skin and the enterical canal. The drug formulation or preparation is usually a stable aqueous solution or sometimes a in oil base when delayed and prolonged absorption of the drug is desired. The most frequently used parenteral routes are intramuscular (IM), intravenous (IV) and subcutaneous (SC). Other less frequently used parenteral routes are intraperitoneal (IP), intrathoracic, intracardiac, intradermal and epidural.

iii. Topical

Topical route of administration simply describes application of drugs locally to the skin and it's adnexia or to any of the mucous membranes. Also included in this route are intrauterine, intravaginal, ocular, rectal, preputial, sublingual and intranasal. Topical drug preparations include ointments, creams, pastes, dusting powders, lotions and sprays.

iv. Pulmonary route (Inhalation)

This route is used for drugs in the gaseous state or volatile agents. They absorbed rapidly from the airways and alveoli into pulmonary circulation. They are usually applied using a nebulizer or by standard anaesthetic machines.

3.2 Veterinary Preparations

Pharmaceutical preparation intended for use in animals come in different forms depending on the species of animals and the disease for which the preparation is targeted towards. The various forms in which these preparations come included but not limited to tablets, capsules, creams, emulsions, ointments, injections, powders, gels, sprays, boluses and drops. For the desired effect to be obtained, the drug must be administered using the appropriate route and in accordance with the manufacturer's recommendation.

3.3 Classes of selected veterinary drugs and examples

Veterinary drugs can be classed based on the organism on which the drug acts or the organ of the body where the drug action is desired. For the purpose of this lecture, the drugs are classified based on the disease-causing agent or aetiology. The classes of the drugs and their examples are given below.

Class of drug Examples of drug preparation

Antibacterial	Oxytetracycline, Streptomycin and Procaine Penicillin
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Antiprotozoans	Dimanazene aceturate, Amprolium and Homidium bromide
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Anthelmintics	Levamisole, Albendazole and Pyrantel pamoate
----------------------	--

Antifungal agents	Ketaconazole, Griseofulvin and Nystatin
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Antidiarrheals	Methoscolamine, Diphenoxylate and Kaopectate
-----------------------	--

Antiinflammatory/analgesics	Dexamethasone, Phenybutazone and acetyl salicylate
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3.4 Ethnoveterinary medicine/practices.

Pastoralists and other livestock farmers in Nigeria like their counterparts in other parts of Africa and the world at large have relied on locally available plants and herbal preparations for treatment of their animals before the advent of western (orthodox) veterinary medicine. This indigenous knowledge system is referred to as ethnoveterinary medicine or practices. Ethnoveterinary medicine includes indigenous beliefs, knowledge, skills, methods and practices pertaining to the health care of animals. Ethno-veterinary medicine is largely used effectively by local farmers for keeping animals healthy and productive. Some advantages of ethnoveterinary medicine is that it is cheaper and based local resources. However, some difficulties associated with ethnoveterinary medicine include, lack of proper documentation and validation, difficulty in standardization and non-availability of plant parts all year round. The use of several medical plants in the treatment of animals has been documented but the absence of standard dosages and preparations hampers their inclusion in normal animal health care delivery systems.

A comparison between ethnoveterinary medicine and orthodox (western) veterinary medicine

Ethnoveterinary Medicine	Orthodox (Western) medicine
--------------------------	-----------------------------

Indigenous, evolved by farmer and farmer oriented	Developed by researchers and science oriented
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Passed on from generation to generation or farmer to farmer	Communicated from researchers to veterinarians
--	--

Compatible with local situation and low dependency on external inputs	May or may not compatible with local situation and more dependent on external inputs
--	--

Not well researched and not well Documented	Very well researched and well documented
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Takes longer to show effects	Effects/results are quicker
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Usually specific to local situation since as it is dependent on locally available inputs	Usually general recommendation not tied to any locality
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4.0 CONCLUSION

In this unit, we have discussed the routes of drug administration in animals and the various forms or preparations in which veterinary drugs supplied. We have also stated the classes of drugs used in treatment of animal diseases. This unit has also defined what ethnoveterinary medicine is and compared it with orthodox (western) veterinary medicine.

5.0 SUMMARY

In this unit, you have learnt that:

- The routes used for drug administration in animals are, oral, parenteral, topical and pulmonary.
- Veterinary drugs come in different forms or preparations namely, tablets, capsules, creams, emulsions, ointments, injections, powders, gels, sprays, boluses and drops.
- Veterinary drugs are classified as antibacterial, antiprotozoan, antifungal, anthelmintics, antidiarrheal and anti-inflammatory/analgesic agents.
- Ethnoveterinary medicine is essentially indigenous knowledge of animal health care by local farmers.

6.0 TUTOR-MARKED ASSIGNMENT

- 1 Give three routes of drug administration in animals and form or preparation used for the routes named.
- 2 List three classes of drugs used in treatment of animals giving using one drug as an example of each class listed.
- 3 State four differences between ethnoveterinary medicine and orthodox (western) medicine.

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