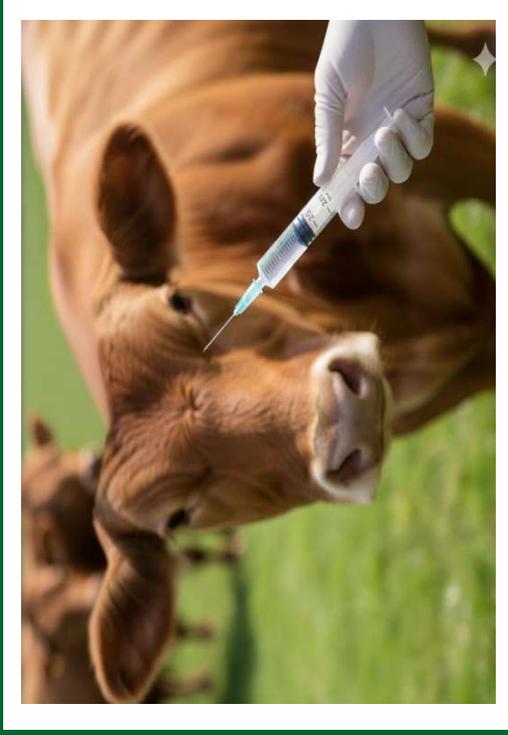




FEDERAL MINISTRY OF LIVESTOCK DEVELOPMENT (FMLD)



GUIDELINES

FOR THE USE OF

NIGERIA ESSENTIAL VETERINARY MEDICINES



Food and Agriculture Organization of the United Nations





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OF LIVESTOCK
DEVELOPMENT

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About the Ministry

The Federal Ministry of Livestock Development (FMLD) was established on July 9, 2024, by President Bola Ahmed Tinubu to transform Nigeria's livestock sector into a sustainable and globally competitive industry. With a mandate to enhance livestock productivity, ensure food security, and drive economic growth, the Ministry is committed to addressing key challenges such as poor infrastructure and conflicts between farmers and herders. FMLD is structured into 17 departments, focusing on areas like livestock breeding, ranch development, pest control, and veterinary public health. Through strategic policies, research, and private-sector engagement, the Ministry aims to modernize livestock farming, create jobs, and boost Nigeria's economy.

Our Mandate

According to a circular issued by the Secretary to the Government of the Federation (SGF), Sen. George Akume, CON, on September 12, 2024, with Ref. No. SGF/OP//S3/X11/218, the Ministry is mandated to “develop the policies and programmes needed to transform the livestock sector into a vibrant, sustainable, as well as globally competitive industry, ensuring food security, economic growth, improved livelihoods for farmers, and maintenance of social harmony.”

Our Vision

To build a resilient, sustainable, and inclusive livestock sector that drives economic growth, ensures food security, and improves livelihoods.

Our Structure

The Federal Ministry of Livestock Development is responsible for formulating and implementing policies to enhance livestock productivity, sustainability, and economic growth. The Ministry operates through 13 specialized departments, including seven (7) technical departments and six (6) common services departments, alongside a Special Duties Office, three (3) units, and seven (7) parastatals/agencies.

- I. **Ruminants and Monogastric Department:** The Department functions in the formation and implementation of policy that enhances the productivity and sustainability of dairy, beef, sheep, cattle, goats, pig, poultry, and other micro livestock sectors. It focuses on improving breeding, managing, practicing, processing, and marketing livestock products for economic growth.
- II. **Ranch and Pastoral Resources Development:** The Department formulates and implements policies for the development and sustainable management of grazing reserves, ranches, and stock routes. It also develops strategies to promote efficient land use within grazing reserves, improving livestock productivity and reducing conflicts between farmers and pastoralists.
- III. **Pest Control Services:** This Department formulates and implements policies for preventing and controlling transboundary pests and vectors of economic and public health importance. It is also responsible for sensitization, advocacy, and monitoring of pesticides used in livestock production.
- IV. **Quality Assurance & Certification:** The Department initiates policy direction on safety guidelines for livestock products to protect animal and public health. It also issues International Veterinary Certificates (export and import permits) in compliance with the World Organization for Animal Health (WOAH).



Guidelines for the Use of Nigeria Essential Veterinary Medicines

FORWARD	4
ACKNOWLEDGEMENTS	5
ABBREVIATIONS AND ACRONYMS	6
GLOSSARY	8
EXECUTIVE SUMMARY	11
CHAPTER ONE	12
1.1 Background	12
1.2 Purpose of the Guidelines and Application	13
1.3 Scope and Application	13
1.4 Principles of Essential Medicines Use in Veterinary Practice	13
CHAPTER TWO	14
2.0 Legal and Regulatory Framework	14
2.1 National and International Guidelines	14
2.2 Regulatory Oversight of Veterinary Medicines	14
2.3. Definition of Different Types of Veterinary Drugs and Products	14
2.4 Control of Drug Sales and Distribution	15
CHAPTER THREE	16
3. Background on the Structure of the Nigeria Essential Veterinary Medicines List (NEVML)	16
3.2 Selection criteria and step-by-step guide for use of NEVMLs	16
3.3 Regular Review and Updating Process	19
CHAPTER FOUR	21
4.0 Rational Use of Essential Veterinary Medicines	21
4.1 Proper Diagnosis and Prescription Practices	21
4.2 Dosage and Administration Guidelines	21
4.3 Extra-label Use and Exceptions	21
4.4 Ensuring Efficacy and Safety	22
CHAPTER FIVE	23

5. Antimicrobial Stewardship and Resistance Management	23
5.1 Overview of Antimicrobial Resistance (AMR) in Veterinary Practice	23
5.2 Responsible Use of Antibiotics	23
5.3 Alternatives to Antimicrobials	23
5.4 Monitoring and Reporting Antibiotic Resistance	23
CHAPTER SIX	25
6. Use of Vaccines in Farm and Clinical Practice	25
6.1 Importance of Vaccination	25
6.2 Vaccination Protocols for Major Livestock Diseases	25
6.3 Vaccination Guidelines for Companion Animals	28
6.4 Record Keeping and Reporting Vaccine Use	29
CHAPTER SEVEN	30
7. Use of Antiparasitic Agents	30
7.1 Control of Internal Parasites in Livestock	30
7.2 Management of External Parasites	30
7.3 Strategic Deworming Programs	30
7.4 Parasite Resistance and Control Measures	31
CHAPTER EIGHT	32
8.0 Pain Management and Anti-Inflammatory Drugs	32
8.1 Managing Pain and Inflammation in Farm Animals	32
8.2 Use of NSAIDs and Steroidal Drugs	32
8.3 Pain Relief in Companion Animals	32
8.4 Guidelines for Post-Operative Pain Management	33
8.5 Guidelines for Use of Veterinary Medicines in Euthanasia	33
CHAPTER NINE	34
9.0 Reproductive Health Medicines and Practices	34
9.1 Hormonal Treatments for Oestrus Synchronisation	34
9.2 Medications for Reproductive Disorders	34
9.3 Assisted Reproductive Technologies (ART)	34
9.4 Ethical Considerations in Reproductive Interventions	35
CHAPTER TEN	36
10. Storage, Handling, and Disposal of Veterinary Medicines	36
10.1 Storage Conditions for Different Categories of Drugs	36
10.2 Expiry Date Monitoring and Inventory Management	36

10.3 Safe Disposal of Unused or Expired Medicines	36
CHAPTER ELEVEN	37
11.1 Overview of ADR in Veterinary Medicine	37
11.2 Establishing a Reporting System for ADR	37
11.4 Adapting Treatment Based on ADR Reports	37
11. Monitoring and Reporting Adverse Drug Reactions	38
CHAPTER TWELVE	39
12. Training and Education in the Use of NEVM	39
12.1 Ongoing Training for Veterinarians and Para-Veterinarians	39
12.2 Farmer Education and Awareness Programs	39
12.3 Public Health and Food Safety Training	39
12.4 Integrating One Health Concepts in Veterinary Education	39
CHAPTER THIRTEEN	40
13.0 Compliance and Enforcement	40
13.1 Essential Veterinary Medicine Regulation Compliance	40
13.2 Penalties for Non-Compliance	40
13.3 Role of Veterinary Inspectors	40
13.4 Reporting Violations	40
CHAPTER FOURTEEN	41
14.0 Conclusion and Future Directions	41
14.1 Summary of Key Principles	41
14.2 Future Challenges and Considerations	41
14.3 Role of Emerging Technologies in Veterinary Medicine	41
14.4 Moving Toward Sustainable Veterinary Practices	41
REFERENCES	42
LIST OF CONTRIBUTORS/ REVIEWERS	45

Forward

The development of the Guidelines for the Nigeria Essential Veterinary Medicines List (NEVML) represents an important milestone in strengthening veterinary pharmaceutical governance and regulatory systems, promoting appropriate use and access to veterinary medicines in Nigeria. Thus, the availability and rational use of quality-assured veterinary medicines are critical to the country's efforts to safeguard animal health, ensure food safety, and combat the growing threat of antimicrobial resistance.

The NEVML serves as a strategic guide for ensuring the responsible selection, procurement, distribution, and use of veterinary medicines across the country. This document represents a collaborative effort involving veterinary professionals, regulatory agencies, academia, development partners, and private-sector stakeholders. It brings together expert inputs which reflect national priorities in alignment with international best practices to safeguard animal health while reducing the risks associated with antimicrobial misuse and resistance.

The Guidelines complements the essential veterinary medicines list and details the approaches to the use of the essential veterinary medicines list in practice. These are requirements for effective disease prevention, diagnosis, and treatment of terrestrial and aquatic animals. It also supports regulatory harmonization, promotes rational medicine use, and enhances access to safe, quality-assured veterinary products. By standardizing national expectations on veterinary medicines, this document strengthens Nigeria's capacity to improve animal health outcomes, protect public health, and contribute to food security and economic resilience.

The successful use of these guidelines relies on the commitment of government institutions, veterinarians, distributors, producers, and allied professionals to adopt and apply its recommendations. We encourage all stakeholders to integrate this guidance into their operations and clinical decision-making, thereby reinforcing Nigeria's dedication to combating AMR and promoting responsible veterinary medicine stewardship.



Idi Mukhtar Maiha, fnim

Honourable Minister

Federal Ministry of Livestock Development

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This document represents a collective national effort toward strengthening veterinary governance, enhancing access to quality-assured veterinary medicines, and promoting sustainable animal health systems in Nigeria.

This publication is produced under the authority of the Federal Ministry of Livestock Development, Abuja, Nigeria.



Dr. Samuel A. Anzaku

Director of Public Health and Epidemiology and Chief Veterinary Officer of Nigeria
Federal Ministry of Livestock Development

ABBREVIATIONS AND ACRONYMS

ADRs	Adverse Drug Reactions
AMR	Antimicrobial Resistance
AMRIS	Antimicrobial resistance Information System
ART	Assisted Reproductive Technologies
AI	Artificial Intelligence
AVM-GSL	Authorised Veterinary Medicine- General Sale List
BST	Bovine Stomatotropin
BVD	Bovine Viral Diarrhoea
CAV	Canine Adenovirus
CBPP	Contagious Bovine Pleuropneumonia
CDV	Canine Distemper Virus
COX	Cyclooxygenase
CPD	Continuous Professional Development
CPV	Canine Parvovirus
EMA	European Medicines Agency
EARS-Net	European Antimicrobial Resistance Surveillance Network
EVML	Essential Veterinary Medicines List
FDVPCS	Federal Department of Veterinary & Pest Control Services
FEC	Faecal Egg Count
FMD	Foot and Mouth Disease
FPV	Feline Parvovirus
FCV	Feline Calicivirus
FHV-1	Feline herpesvirus type 1
FeLV	Feline Leukemia Virus

InFARM	International FAO Antimicrobial Resistance Monitoring System
IPM	Integrated Pest Management
NAFDAC	National Agency for Food and Drug Administration and Control
NADIS	National Animal Disease Information System
NARMS	National Antimicrobial Resistance Monitoring Systems
NEVMs	Nigeria Essential Veterinary Medicines
NEVML	Nigeria Essential Veterinary Medicines List
NFA-VPS	Non-food animal: veterinarian, Pharmacist, Suitably Qualified Person
NSAIDs	Nonsteroidal Anti-inflammatory Drugs
PPR	Peste des petit ruminants
POM-V	Prescription-only medicine – Veterinarian
POM-VPS	Prescription-only medicine – veterinarian, pharmacist, suitably qualified Person
VMPs	Veterinary Medicinal Products
WHO	World Health Organisation
WOAH	World Organisation for Animal Health
WSAVA	World Small Animal Veterinary Association
°C	Degree Celsius
%	Percentage

GLOSSARY

Access Antibiotics: A category of antibiotics recommended as first-line treatments due to their efficacy, safety, and lower risk of resistance development. They are preferred over Watch or Reserve antibiotics in antimicrobial stewardship.

Adverse Drug Reaction (ADR): Any unintended or harmful response resulting from the administration of a veterinary medicine. Includes mild to severe reactions requiring monitoring and reporting to regulatory systems.

Anaesthetics: Medicines used to induce loss of sensation or consciousness for surgery or immobilisation (e.g., inhalant anaesthetics, barbiturates, dissociative agents).

Anthelmintics: Drugs used to treat internal parasitic worm infections (helminths) in animals.

Antibacterials: Medicines used to treat bacterial infections. Categories include narrow-spectrum, broad-spectrum, first-line (essential) and restricted antibiotics.

Antimicrobial Resistance (AMR): The ability of microorganisms (bacteria, viruses, fungi, parasites) to resist antimicrobial treatment, making infections harder to treat. A major concern in both veterinary and human health.

Antimicrobial Stewardship: A coordinated strategy promoting appropriate use of antimicrobials to slow resistance development, improve clinical outcomes, ensure prudent use, and protect public health.

Antiparasitics: medicines used to manage internal or external parasites in livestock and companion animals.

Antiprotozoals: Drugs that target protozoan infections.

Antivirals: Medicines used to treat viral infections in animals.

Authorised Veterinary Medicine – General Sale List (AVM-GSL): Medicines considered safe for sale without a prescription due to their wide safety margins.

Biosecurity: Measures taken to reduce disease introduction and spread within farms, veterinary hospitals, and animal environments.

Complementary Veterinary Medicines: Medicines used for priority animal diseases requiring specialist diagnostics, advanced monitoring, or specialised training. They may be cost-intensive or less available.

Critically Important Antimicrobials (CIA/HPCIA): Antibiotics classified by WHO and WOAHA as essential for human medicine and therefore subject to restrictions in animals (e.g., fluoroquinolones, macrolides, 3rd/4th-gen cephalosporins, colistin).

Deworming: Administration of anthelmintics to remove internal parasites, usually performed strategically using FEC, rotation, and refugia principles.

Drug Withdrawal Period: The minimum time required after administration of a veterinary drug before an animal or its products (meat, milk, eggs) can enter the food chain, to avoid harmful residues.

Emergency Veterinary Medicines: Drugs administered to manage life-threatening or time-critical conditions where delays could cause severe harm or death.

Essential Veterinary Medicines: Medicines considered necessary for primary veterinary healthcare delivery — selected based on safety, efficacy, cost-effectiveness, relevance to disease burden, and public health importance.

Essential Veterinary Medicines List (EVML/NEVML): The national guideline listing essential, emergency, and complementary veterinary medicines available for use in Nigeria.

Extra-Label Use (Off-Label Use): Use of a veterinary drug in a manner not specified in the approved label — permitted only under veterinary supervision with justification and documentation.

Faecal Egg Count (FEC): A diagnostic test to quantify parasite eggs in faeces, used to guide deworming programs and prevent antiparasitic resistance.

Good Emergency Management Practices (GEMP): Best practices for preparedness and management of emergency diseases (e.g., ASF), often included in veterinary training.

Immunologicals: Biological preparations such as vaccines, antisera, and antitoxins used to induce immunity or provide passive protection.

Inactivated Vaccine: A vaccine containing killed pathogens; used when safety or stability is a concern.

Live Attenuated Vaccine: A vaccine containing weakened pathogens capable of stimulating strong immunity.

Narrow-Spectrum Antibiotics: Antimicrobials active against a limited range of organisms. Preferred for stewardship.

National Animal Disease Information System (NADIS): Nigeria's system for disease surveillance and reporting.

National Agency for Food and Drug Administration and Control (NAFDAC): The national regulatory authority responsible for approval, quality control, and oversight of veterinary medicinal products.

Pharmacovigilance: The monitoring, reporting, and analysis of adverse drug reactions and product defects.

Prescription-Only Medicine – Veterinarian (POM-V): Medicines that can be prescribed only by a licensed veterinarian.

Probiotics / Prebiotics / Synbiotics: Biologicals used to improve gut health and immunity; included within essential veterinary biological categories.

Rational Use of Medicines: Ensuring medicines are prescribed appropriately based on diagnosis, correct dosage, correct duration, and the lowest effective cost.

Reserve Antibiotics: Last-line antibiotics (e.g., colistin) used only when absolutely necessary and after laboratory confirmation, due to high resistance risk.

Restricted Medicines: Medicines prohibited for use in food-producing animals or requiring special authorisation (often marked with an asterisk * in the NEVML).

Snake Antivenin: Biological product used to neutralise snake venom, included in essential lists for emergency cases.

Therapeutic Class: Grouping of medicines based on mode of action or purpose (e.g., analgesics, antimicrobials, antiparasitics, vaccines).

Vaccination Protocol: A structured plan detailing timing, dosage, type, and species applicability of vaccines for disease prevention.

Veterinary Council of Nigeria (VCN): The regulatory body overseeing veterinary education, licensing, and professional standards in Nigeria.

Veterinary Medicinal Products (VMPs): Any substance or combination of substances used to diagnose, treat, or prevent diseases in animals.

Veterinary Product Distributor/Manufacturer/Importer: Legal classifications describing entities that produce, distribute, import, or export veterinary drugs under regulatory control.

Watch Antibiotics: Antibiotics with a higher resistance potential; used cautiously and not as first-line agents.

EXECUTIVE SUMMARY

The Guidelines for the Use of the Nigeria Essential Veterinary Medicines List (NEVML) in Farm and Clinical Practice establish a comprehensive framework to promote responsible, effective, and sustainable veterinary care amid rising global challenges, including antimicrobial resistance (AMR), food safety, animal welfare, and zoonotic disease risks. Aligned with the One Health approach and international standards from WHO and WOAHA, the guidelines prioritise rational medicine use, public health protection, and equitable access to essential treatments in Nigeria.

Key principles emphasise evidence-based selection, proper diagnosis, accurate dosing, adherence to withdrawal periods, and judicious antimicrobial prescribing to curb resistance. NEVMLs are classified by therapeutic category, species (livestock and companion animals), and distribution controls. The selection criteria focus on efficacy, safety, cost-effectiveness, and local disease prevalence, with mandated periodic reviews to incorporate emerging threats and resistance patterns.

The guidelines detail best practices across critical areas: antimicrobial stewardship through diagnosis-driven prescribing, alternatives like vaccination and biosecurity, and resistance monitoring via systems such as AMRIS, NADIS and InFARM; vaccination protocols for major livestock diseases Foot and Mouth Disease, Bovine viral diarrhoea, Porcine reproductive and respiratory syndrome, pest des petits ruminants, Newcastle, and contagious bovine pleuropneumonia and companion animals; strategic antiparasitic use with refugia, rotation, and faecal egg count-guided deworming to combat resistance; pain management using multi-modal analgesia (NSAIDs, opioids, local anaesthetics) for surgical and chronic conditions; reproductive health interventions including oestrus synchronization, disorder management, and assisted technologies under veterinary oversight; and safe storage, handling, expiry monitoring, and eco-friendly disposal of medicines.

Regulatory compliance is enforced through licensed distribution, prescription-only access, pharmacovigilance for adverse drug reactions, and penalties for violations. Training mandates continuous education for veterinarians, para-professionals, and farmers on the use NEVML, One Health integration, and ethical prescribing. The guidelines advocate sustainable practices, minimising overuse, promoting alternatives, and leveraging emerging technologies like Artificial Intelligence (AI) for tracking, to ensure long-term animal productivity, food security, and environmental health. Regular updates will address evolving challenges, reinforcing NEVMLs as vital tools for standardised, high-quality veterinary care nationwide.

CHAPTER ONE

1.1 Background

The guidelines for the use of Nigeria Essential Veterinary Medicines (NEVMs) in farm and clinical practice are hinged on the growing need to ensure responsible, effective and sustainable veterinary care, particularly in light of the global challenges such as antimicrobial resistance (AMR), animal welfare, and food safety. The development and implementation of these guidelines are driven by several factors, including the increased demand for animal products, particularly in developing countries, where there has been a growing need for efficient and effective veterinary care to ensure animal health and productivity. Intensive livestock farming, which often involves confining large numbers of animals, increases the risk of disease outbreaks. This makes the use of essential veterinary medicines a critical component of disease prevention and treatment. Animals, particularly those in agriculture, are potential sources of zoonotic diseases. Effective guidelines for the use of NEVMs help control the transmission of diseases from animals to humans, thereby protecting public health. Veterinary medicines used in livestock can affect the safety of animal products consumed by humans. The guidelines for essential medicines emphasize the use of proper dosage, withdrawal periods, and adherence to regulatory standards to ensure that residues of drugs do not remain in meat, milk, or eggs. The misuse and overuse of antibiotics in both human and veterinary medicine have contributed to the rise of antimicrobial resistance. This has made some microbial infections more difficult to treat and increased the risk of drug-resistant pathogens entering the food chain from animals. NEVM guidelines help enforce policies on the responsible use of antibiotics in farm and clinical practice, promoting the use of alternatives such as vaccination and improving hygiene practices to prevent the spread of infection, rather than relying solely on antimicrobial treatments. The World Health Organization (WHO) and the World Organisation for Animal Health (WOAH) have recognized the need for a rational approach to veterinary medicine use, pushing for the creation of essential medicines lists at the national level. The WOAH has been particularly involved in promoting antimicrobial resistance mitigation strategies in veterinary medicine. The development of NEVM guidelines aligns with the One Health framework, which emphasizes the interconnectedness of human, animal, and environmental health. Managing the use of veterinary medicines plays a key role in ensuring the health of animals and the broader ecosystem.

Many countries, particularly those with large agricultural sectors, have responded to these global calls by developing their own national guidelines for essential veterinary medicines. These guidelines provide a framework for regulating veterinary drugs, ensuring their safe and proper use, and promoting animal health. The concept of "essential" veterinary medicines also stems from the need to prioritize cost-effective treatments, especially in regions with limited resources. By focusing on medicines that provide the most significant benefit for the most common and pressing animal health problems, governments and veterinary bodies can ensure that essential treatments are accessible and affordable for farmers. The rational use of veterinary medicines ensures the long-term sustainability of farming practices by minimizing the development of drug-resistant strains of pathogens and ensuring that animals remain healthy and productive over time. The proper use of veterinary medicines, guided by national essential lists, helps ensure that farm animals are treated humanely and are free from pain, suffering, and disease. This aligns with broader efforts to promote animal welfare in both clinical and farm settings. NEVMs provide a way to ensure that even rural and under-resourced areas have access to essential veterinary care. By establishing clear guidelines and lists of essential medicines, veterinary services can be standardized, and care can be more equitably distributed. In clinical veterinary practice, having a national guideline for essential medicines ensures a standard treatment protocol across various regions. This helps maintain consistent care quality in veterinary hospitals and clinics, allowing veterinarians to provide evidence-based treatments. The background of the NEVM guidelines is shaped by the need to address global veterinary challenges, including rising food demand and the fight against antimicrobial resistance, while

supporting public health, food safety, animal welfare, and sustainable farming practices. These guidelines serve as an essential tool for both farm and clinical veterinary practitioners to ensure the safe, effective, and responsible use of veterinary medicines across a variety of animal species and health conditions.

1.2 Purpose of the Guidelines and Application

A. The Nigeria Essential Veterinary Medicines List (NEVML) is designed to achieve the following purpose

1. Recognise that the NEVML is designed to:
 - Guide **rational selection, procurement, distribution, and use** of veterinary medicines.
 - Promote **AMR containment**, drug quality assurance, and food safety.
 - Support clinical decisions in terrestrial and aquatic animals.
2. Note that the NEVML:
 - Is **not a formulary**, nor a complete compendium of all veterinary medicines.
 - Includes **Essential, Emergency, and Complementary** medicines.
 - Identifies medicines **prohibited in food-producing animals** by marking them with an asterisk (*).

1.3 Scope and Application

The purpose of this guidance is to provide practical assistance to help members of the profession better understand what constitutes routine veterinary practice, empowering those in practice to make their own judgement about routine veterinary practice and clinical veterinary research in the course of their day-to-day practice

1.4 Principles of Essential Medicines Use in Veterinary Practice

The responsible use of veterinary medicines for therapeutic and prophylactic purposes is skills, a key skill of a veterinary surgeon, and crucial to animal welfare and the maintenance of public health.

CHAPTER TWO

2.0 Legal and Regulatory Framework

Veterinary products play a crucial role in the prevention and control of animal diseases. The definition of veterinary products may vary from one country to another; for WOAHP purposes, they include vaccines, veterinary medicines such as antimicrobial agents, and diagnostic kits. To ensure effective and sustainable animal disease control, while minimizing risk to animals and humans, governments are expected to provide appropriate regulations on the authorization, manufacturing, distribution, and use of veterinary products through their veterinary legislation.

2.1 National and International Guidelines

The marked increase in demand for high-quality animal protein necessitates protecting animals from infectious diseases. This requires an increase in the use of veterinary therapeutics. The overuse and misuse of veterinary products can pose a risk to human health, either in the form of short-term or long-term health problems. However, the biggest problem is the emergence of resistant strains of bacteria or parasites. This is in addition to economic losses due to the discarding of polluted milk or the condemnation of affected carcasses. This necessitates the prudent application of national and international guidelines in all aspects of the use and trade of veterinary drugs and products.

2.2 Regulatory Oversight of Veterinary Medicines

All users of NEVMs must comply with national laws and regulations regarding the prescription, purchase, and use of essential veterinary medicines. The NEVM list should be periodically reviewed and updated based on new evidence, including data on drug importation, distribution, and use; emerging diseases; and drug resistance patterns. Veterinary pharmacies and dispensaries must be licensed and regularly inspected to ensure compliance with regulations and standards. It is recommended that this guideline be reviewed every two years and be adopted to guide the importation and local manufacturing of veterinary medicines in Nigeria.

2.3. Definition of Different Types of Veterinary Drugs and Products

1. Veterinary Drug and Product Manufacturer refer to any establishment engaged in operations involved in the production of a drug including propagation, processing, compounding, filling, repackaging, labelling, advertising, storage, distribution or sale of the veterinary drug products proving that for the purposes of this regulation the compounding and filling of prescription by drugstores shall not be considered as production operations.
2. Veterinary Drug and Product Traders refer to any establishment that is a registered owner of the drug product, procures the raw materials and packaging components, and provides the production monographs, quality control standards, and procedures, but subcontracts the manufacture of such veterinary drug and product to a licensed manufacturer. In addition, a trader may also engage in the distribution and/or marketing of veterinary drugs and products.
3. Veterinary Drug and Product Importer/Importer refer to any veterinary drug and product establishment that imports raw materials, active ingredients, and/or finished products, for its own use or for wholesale or distribution to other drug establishments or outlets.
4. Veterinary Drug and Product Exporter/ Exporter refer to any veterinary drug and product establishment that exports raw materials, active ingredients and / or finished products to another country.
5. Veterinary Drug and Product Distributor, Wholesaler refers to any veterinary drug and product establishment that procures raw materials, active ingredients and/or finished products from local establishments for local distribution on a wholesale basis.

2.4 Control of Drug Sales and Distribution

Controlling the sales and distribution of Veterinary drugs involves several regulatory measures to ensure the safety and efficacy of these medications. Here are some key aspects:

1. **Regulatory Agencies:** In many countries, agencies similar to the National Agency for Food and Drug Administration and Control (NAFDAC) oversee the approval, sales, and distribution of veterinary drugs, which include some vaccines. They ensure that these drugs are safe and effective for use in animals.
2. **Prescription requirements:** Veterinary drugs, especially those that are prescription-only, can only be dispensed by a licensed veterinarian or pharmacist. This ensures that the drugs are used appropriately and reduces the risk of misuse.
3. **Labelling and packaging:** Proper labelling and packaging are crucial. Labels must include information on dosage, administration, withdrawal period, and potential side effects. This helps in preventing misuse and ensures that the drugs are used safely.
4. **Monitoring and Reporting:** Systems like the Antimicrobial Resistance Information System (AMRIS), National Animal Disease Information System (NADIS), and International FAO Antimicrobial Resistance Monitoring System (InFARM) track the use and resistance patterns of antimicrobial drugs in animals. This helps in understanding trends and making informed decisions about drug use.
5. **Legal Framework:** Laws and regulations at both the federal and state levels govern the distribution and sale of veterinary drugs. These laws ensure that only approved drugs are sold and that they are distributed through authorised channels.

CHAPTER THREE

3. Background on the Structure of the Nigeria Essential Veterinary Medicines List (NEVML)

The Guideline for the Use of the Nigeria Essential Veterinary Medicines List (NEVML) provides a framework for the rational and standardised use of veterinary medicines across the country. It is intended for veterinarians, regulatory authorities, policymakers, pharmaceutical suppliers, training institutions, and other stakeholders in the animal health sector. The guideline supports the implementation of the National Veterinary Drug Policy, promotes good veterinary governance, and strengthens antimicrobial stewardship within the One Health landscape.

The Nigeria Essential Veterinary Medicines List (NEVML) itself is a key national policy tool that guides the selection, procurement, distribution, and responsible use of essential veterinary medicines. It ensures that quality-assured, safe, and effective medicines are available and affordable to meet priority animal health needs. Developed through a consultative, evidence-based process involving academia, regulatory agencies, professional associations, and private sector stakeholders, the NEVML enhances access to critical veterinary products while aligning with global standards for antimicrobial resistance (AMR) containment.

Structurally, the NEVML is organised into seven major sections and annexes for clarity and ease of use:

- Section 1 outlines foundational concepts, including definitions, selection criteria, and the classification of medicines into *essential*, *emergency*, and *complementary* categories.
- Section 2 constitutes the main *Essential Veterinary Medicines List*, arranged by therapeutic classes with information on drug names, formulations, and indications.
- Section 3 details *Essential Veterinary Vaccines*, grouped by pathogen and host species to support disease prevention and control.
- Sections 4 to 7 present *snake antivenins*, *immunologicals*, and *biological preparations* such as probiotics, prebiotics, and synbiotics used to enhance animal health and productivity.

The Annexes complement these sections by incorporating the *WHO AWaRe classification of antibiotics* and the *WOAH categorisation of veterinary-important antimicrobials*, providing guidance on prudent antimicrobial selection and use.

The NEVML is designed as a living document, subject to periodic review and updating in response to emerging diseases, new technologies, and evolving therapeutic needs. Its structure promotes harmonisation with international standards, facilitates effective service delivery, and strengthens Nigeria's capacity for responsible veterinary medicine management and public health protection.

3.2 Selection criteria and step-by-step guide for use of NEVMLs

NEVMs should be chosen based on their efficacy, safety, cost-effectiveness, and relevance to the local and national disease burden in terrestrial and aquatic animals. Only medicines on the approved NEVM list should be used unless otherwise advised by the regulatory authorities. Extra-label use must be justified, documented, and approved by veterinary oversight bodies. Medicines must be used in a way that prioritizes animal welfare and public health, avoiding abuse.

A. Use the NEVML to locate the appropriate drug category

The NEVML groups medicines into major therapeutic classes.
To use it correctly:

1. Go to the relevant section based on the case:
 - **Anaesthetics / Sedatives**
 - **Analgesics / NSAIDs**
 - **Anthelmintics**
 - **Antibacterials**
 - **Antiprotozoals**
 - **Antivirals / Vaccines**
 - **Fluids / Electrolytes**
 - **Toxins / Poisoning**
 - **Dermatological, Ophthalmic, Pesticides, etc.**
2. Identify the **generic name, formulation, route, and indication** provided in the tables

B. Confirm species suitability and indications

For each medicine:

1. Verify that the drug is indicated for:
 - The **correct animal species**
 - The **type of infection/disease** present
2. Check whether the drug:
 - Is listed for terrestrial or aquatic animals
 - Is used for food-producing species
 - Requires specific diagnostic confirmation

C. Check for Banned or Restricted Medicines

The NEVML highlights medicines **not permitted in food animals** (marked with an asterisk “*”).

When using the document:

1. Confirm if:
 - The medicine is banned for food-producing animals
 - It belongs to the **WHO or WOAHA critically important antimicrobials (HPCIIAs)**
2. Apply restrictions:
 - Never prescribe banned products for livestock or poultry.
 - Avoid fluoroquinolones, macrolides, 3rd–4th generation cephalosporins, or colistin as **first-line therapy**.
3. Use the Annex on **WHO AWaRe** and **WOAHA categorisation** to guide prudent antimicrobial selection.

D. Select the Appropriate Medicine

Choose the best medicine based on:

1. **First-line priority** (Essential medicines)
2. **Proven efficacy and safety**
3. **Cost-effectiveness**
4. **Availability within Nigeria**
5. **WOAHA and WHO stewardship rules**
6. **Avoiding medicines requiring specialist settings**, unless available (Complementary list)

Where applicable, choose:

- Narrow-spectrum over broad-spectrum antimicrobials
- Access group antibiotics over Watch/Reserve groups
- Medicines with fewer resistance risks

E. Confirm Dosage Form, Strength, and Route

The NEVML provides formulation types (injectable, suspension, bolus, powder, creams).

Before prescribing:

1. Select the correct **formulation** based on:
 - Species
 - Clinical condition
 - Route suitability (IV, IM, SC, PO, topical)
2. Confirm dosage from:
 - Nigerian Veterinary Formulary
 - Manufacturer inserts
 - Standard veterinary pharmacology texts (not included in NEVML)

Note: The NEVML provides the medicine, not the dose.

F. Check Contraindications, Interactions, and Food Safety

Follow this checklist:

1. Is the drug contraindicated in certain species?
2. Is the drug prohibited in food-producing animals?
3. Are withdrawal periods required?
4. Are there risk factors such as pregnancy, renal impairment, dehydration, or stress?
5. For antimicrobials, is culture and sensitivity required?
6. For antiparasitics, is resistance reported in the area?

G. Apply Antimicrobial Stewardship Principles

Use the Annex and main list to ensure:

1. **Avoidance of critically important antimicrobials** unless absolutely necessary.
2. **Second-line antimicrobials only after failure of first-line therapy** or confirmed resistance.
3. **Never use antibiotics for growth promotion.**
4. **Never use Reserve antibiotics** (e.g., colistin) without laboratory justification.
5. Document:
 - Drug choice
 - Dosage and duration
 - Reason for deviation from first-line drugs

H. Follow the Appropriate Vaccination Guidelines

When selecting vaccines from the NEVML:

1. Match the vaccine to the species and disease:
 - Rabies – dogs, cats
 - PPR – small ruminants
 - ND/Gumboro/Marek's – poultry
 - AHS – equines
2. Use correct vaccine type (live attenuated, killed, subunit, recombinant).
3. Observe:
 - Cold chain requirements
 - Booster intervals
 - Herd immunity needs
 - Outbreak vs routine vaccination protocols

I. Document All Treatments as Required by Regulation

For compliance with FDVPCS, VCN, and NAFDAC:

1. Record:
 - Drug
 - Batch number
 - Dose and route
 - Date/time
 - Name of clinician
 - Withdrawal period
 - Outcome
2. Keep treatment logs for at least **3 years**.

J. Use the NEVML for Procurement and Supply Chain Management

Procurement officers should use the NEVML to:

1. Prioritize essential medicines for stocking.
2. Avoid buying banned or restricted products.
3. Ensure sourcing from **NAFDAC-registered suppliers**.
4. Maintain stock levels to avoid shortages.
5. Prevent importation of products outside the essential list without justification.

3.3 Regular Review and Updating Process

This includes measures to support the availability and safety of veterinary medicines, as well as enhanced action against antimicrobial resistance.

Users should contribute by:

1. Reporting:
 - Emerging diseases
 - New medicines
 - Resistance patterns
2. Participating in:

- National review workshops
- Consultations
- Validation processes

CHAPTER FOUR

4.0 Rational Use of Essential Veterinary Medicines

Veterinary drugs are used as therapeutic, prophylactic, and for growth promotion, and can be used in either a rational or irrational way. Rational use of drugs means the sick animals receive medications appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period of time, and at the lowest cost to them and their community. Irrational drug use is characterised by under-prescription, over-prescription, inappropriate dosage, incorrect duration, and unnecessary risk. There are several reasons that may contribute to the irrational use of drugs. Some of them are a lack of awareness, inadequate training and education, poor communication between veterinarians and animal owners, and a lack of diagnostic capabilities. The potential public health hazard associated with irrational drug use in food animals includes limited efficacy, increased risk of unwanted effects such as the emergence of drug-resistant pathogens and drug residue, waste of resources, and psychosocial impacts. However, rational use of drugs in veterinary medicine has manifold significance; it can be either public health significance, to improve food safety concerns, reduce the development of drug resistance, residue, or economic significance; the need to rely on more expensive drugs and international trade barriers. Some of the measures that promote rational drug use are: herd health management, alternatives for antimicrobial growth promoters, adhering to withdrawal periods, and minimizing the misuse of antimicrobials.

4.1 Proper Diagnosis and Prescription Practices

Proper diagnosis and prescription practices are crucial in veterinary medicine to ensure effective treatment and prevent abuse of medications. Diagnosing a condition requires a thorough understanding of the animal's health history, clinical signs, laboratory tests, and, in some cases, imaging studies. Veterinarians must avoid prescribing treatments without confirming the diagnosis, as this can lead to ineffective treatment, worsening of the condition, and/or the development of drug resistance.

4.2 Dosage and Administration Guidelines

Adhering to proper dosage and administration guidelines is essential for the safe and effective use of veterinary medications. The dosage depends on various factors, including the type of medication, the animal's species, weight, age, health condition, and the severity of the disease. Over- or under-dosing can lead to treatment failure, toxicity, or the development of resistance. For antimicrobial drugs, it is recommended that veterinarians, as well as all veterinary hospitals and clinics/hospitals to adhere to the national guidelines for the use of antimicrobial drugs in animals.

Veterinarians should calculate the appropriate dose based on the animal's body weight and specific needs. It is vital to follow the manufacturer's instructions or established veterinary guidelines for each drug. For instance, antibiotics may have strict dosage requirements to prevent the development of resistance. The route of administration (oral, intravenous, intramuscular, etc.) also affects the efficacy of the drug. Some medications require precise administration to achieve therapeutic levels in the bloodstream or specific tissues. For example, certain parasitic treatments are most effective when administered topically or subcutaneously. Completing the full course of treatment is critical, especially for antibiotics, to ensure that the pathogen is completely eliminated and does not develop resistance.

4.3 Extra-label Use and Exceptions

Extra-label use of veterinary drugs refers to the use of a medication in a manner not specified by the official label, such as for an unapproved species, condition, or dosage regimen. While Extra-label use can sometimes be necessary, it must be approached with caution and always under veterinary supervision. When prescribing Extra-label, veterinarians must thoroughly evaluate the risks and benefits, especially in

food-producing animals, where drug residues can affect human health. Residue monitoring and adherence to withdrawal periods are critical in these cases to prevent contamination of the food supply. Some drugs are strictly prohibited for Extra-label use due to public health risks. For instance, chloramphenicol and nitrofurans are banned in food animals due to their carcinogenic potential.

4.4 Ensuring Efficacy and Safety

Ensuring the efficacy and safety of veterinary treatments involves a multifaceted approach, including proper drug selection, dosage, administration, and monitoring. It also requires addressing the risks associated with medication side effects and ensuring that treatments are tailored to individual animals' specific needs. After prescribing and administering treatment, veterinarians must monitor the animal to confirm that the treatment is effective. In some cases, follow-up tests or check-ups are necessary to ensure that the condition is resolving as expected. Veterinarians must educate animal owners on potential side effects, drug interactions, and precautions to ensure safe administration, especially with drugs that have narrow therapeutic margins, such as non-steroidal anti-inflammatory drugs (NSAIDs) and some antimicrobials. Reporting adverse drug reactions is essential for maintaining the overall safety of veterinary medicines. National and international pharmacovigilance programs collect data on such reactions to improve future treatments and guidelines.

CHAPTER FIVE

5. Antimicrobial Stewardship and Resistance Management

The rise of antimicrobial resistance (AMR) has become a critical concern in both human and veterinary medicine, requiring coordinated stewardship efforts to mitigate its impact. In veterinary practice, the widespread use of antimicrobials for disease prevention, treatment, and growth promotion in terrestrial and aquatic animals has contributed to the emergence of resistant pathogens. Responsible antimicrobial stewardship involves implementing strategies that promote the judicious use of antibiotics, reducing the selection pressure for resistance while maintaining animal health and productivity. This should be guided by the provisions of the National Guidelines for Use of Antimicrobials in Food Animals.

5.1 Overview of Antimicrobial Resistance (AMR) in Veterinary Practice

Antimicrobial resistance (AMR) is a global public health threat that affects the efficacy of antibiotics used in veterinary medicine. Over time, excessive and inappropriate use of antibiotics in animal farming has accelerated the development of resistant bacteria, which can be transmitted to humans through direct contact, environmental exposure, or the food chain. In veterinary settings, resistance is commonly observed in bacteria such as *Salmonella*, *Escherichia coli*, *Staphylococcus aureus*, and *Campylobacter* species. These pathogens not only affect animal health but also pose significant zoonotic risks. Resistance mechanisms include mutations in target genes, efflux pumps that expel antibiotics from bacterial cells, and the production of enzymes like beta-lactamases, which degrade antibiotic molecules. The spread of resistant bacteria from animals to humans is facilitated by the use of antibiotics for non-therapeutic purposes, such as growth promotion in livestock, poultry and aquaculture. In response, several countries have implemented regulations to restrict or ban the use of antibiotics for growth promotion, advocating for antimicrobial stewardship practices

In Nigeria, recent data indicate high AMR rates, with over 77% of livestock owners using antibiotics without veterinary guidance, leading to an estimated 11% loss in livestock production by 2050 if unchecked. Studies from 2025 show 67.8% MRSA resistance in tertiary hospitals (with veterinary linkages) and widespread resistance in poultry and companion animals.

5.2 Responsible Use of Antibiotics

Medicines listed in NEVMLs must only be prescribed by licensed veterinarians after a proper diagnosis. Prescriptions should specify the exact dosage, frequency, and duration of treatment. The use of antimicrobial agents should be judicious to prevent the development of resistance. Veterinarians must adhere to antimicrobial resistance (AMR) guidelines and encourage responsible use in farm settings. Continuous monitoring of treatment outcomes is essential conducted to ensure efficacy and detect adverse effects early. For medicines used in food-producing animals, adhere strictly to the withdrawal periods to ensure food safety. Further details can be found in the National Guidelines for Use of Antimicrobial Drugs in Animals.

5.3 Alternatives to Antimicrobials

Encourage the use of preventive such as vaccination, proper nutrition, and good hygiene, to reduce reliance on curative medications, particularly antibiotics. Promote the development of new veterinary medicines, especially alternatives to antibiotics, and support research into disease prevention and sustainable animal health practices.

5.4 Monitoring and Reporting Antibiotic Resistance

Monitoring and reporting antibiotic resistance are crucial components of an effective AMR management strategy in veterinary medicine. Surveillance systems track patterns of antimicrobial use and resistance, providing vital data to guide stewardship practices and regulatory measures. Countries with well-

developed animal health infrastructures typically have national or regional programs in place to monitor antibiotic resistance in food-producing animals. Examples include the Antimicrobial Resistance Information System (AMRIS), National Animal Disease Information System (NADIS), International FAO Antimicrobial Resistance Information Systems (InFARM), European Union's European Antimicrobial Resistance Surveillance Network (EARS-Net), and the United States' National Antimicrobial Resistance Monitoring System (NARMS), which track antimicrobial susceptibility in animal pathogens. These programs focus on identifying trends in resistant pathogens, assessing the efficacy of antimicrobials used in veterinary practice, and providing data for risk assessments. In addition to these national efforts, the World Health Organization (WHO) and the World Organisation for Animal Health (WOAH) advocate for a One Health approach, integrating human, animal, and environmental surveillance.

CHAPTER SIX

6. Use of Vaccines in Farm and Clinical Practice

The use of vaccines in farm and clinical practice plays a vital role in reducing the reliance on antibiotics and managing antimicrobial resistance. Vaccination helps prevent the onset of bacterial, viral, and parasitic infections, thus reducing the need for antimicrobial treatments. This approach is particularly important in livestock farming, where preventing disease outbreaks can improve animal health, enhance productivity, and lower the use of antibiotics. In farm settings, vaccines are routinely administered to prevent livestock diseases such as foot-and-mouth disease (FMD), bovine viral diarrhoea (BVD), and Newcastle disease in poultry. Vaccination programs are designed based on the specific needs of the herd or flock, local disease epidemiology, and the health status of the animals. For example, in poultry, live attenuated vaccines are used to control viral diseases like infectious bronchitis, while inactivated vaccines are employed to provide longer-lasting immunity in layers. In clinical veterinary practice, vaccines are also crucial for companion animals. Vaccination protocols for pets typically include core vaccines for diseases such as rabies, distemper, and parvovirus, as well as non-core vaccines depending on the animal's risk factors. Vaccines reduce the incidence of clinical disease, lower the overall bacterial load in populations, and minimize the transmission of infectious agents. As a result, the need for antibiotics to treat secondary bacterial infections is reduced. Moreover, by preventing zoonotic diseases, vaccines protect public health by minimizing the spread of pathogens from animals to humans. Furthermore, the development of vaccines targeting specific bacterial pathogens responsible for foodborne illnesses, such as Salmonellosis, has been a promising step in reducing the reliance on the use of antimicrobials in livestock. With growing consumer demand for antibiotic-free products, vaccination is becoming an essential tool for sustainable farming practices.

6.1 Importance of Vaccination

Since their introduction in the 1800s, vaccines have undeniably been the most effective medical measure for preventing infectious diseases in both animals and humans. Vaccination against zoonotic or food-borne diseases aims to reduce or eliminate risks for consumers and, in some cases, enhance animal productivity. Vaccinating against food-borne infections is widely recognized as the most effective public health strategy, offering the highest cost-benefit ratio, and plays a crucial role in achieving the Millennium Development Goals of reducing mortality, improving health, and fostering socio-economic development. Due to the economic impact of these diseases and the challenges in controlling them with chemotherapy, along with growing drug resistance, designing vaccines for food-borne parasitic infections is critical for both human and animal health. With antibiotic resistance reducing treatment options for veterinarians, vaccines are essential tools for disease control. Additionally, public demand for chemical-free food, driven by concerns about drug residues in meat, eggs, and milk, underscores the need for new veterinary vaccines.

6.2 Vaccination Protocols for Major Livestock Diseases

Vaccination protocols are critical for managing and preventing the spread of infectious diseases in terrestrial and aquatic animals, which significantly impacts both animal welfare and productivity. These protocols employ a systematic approach to immunizing animals at specific stages of their life cycle to build immunity against common diseases, reduce outbreaks, and enhance herd health. The choice of vaccine, timing of administration, and follow-up booster shots depend on various factors, including the species, age, and health status of the animals, as well as the local epidemiology of the diseases. Below is an overview of vaccination strategies for major livestock diseases:

1. Foot-and-Mouth Disease

Foot-and-mouth disease is one of the most contagious viral diseases affecting cloven-hoofed animals including cattle, sheep, goats, and pigs. The vaccination protocol for FMD typically involves:

- **Primary Vaccination:** In young animals, primary vaccination is usually administered at 4-6 months of age.
- **Booster Doses:** Booster vaccinations are essential every six months to maintain immunity in endemic area.
- **Mass Vaccination Campaigns:** In regions where FMD is endemic, large-scale vaccination campaigns are often implemented to reduce the incidence of outbreaks and promote herd immunity.

2. Bovine Viral Diarrhoea

Bovine viral diarrhoea is a highly contagious disease that causes significant economic losses in cattle industries worldwide. A comprehensive vaccination protocol for BVD includes:

- **Initial Vaccination:** Calves are typically vaccinated at 6-8 months of age.
- **Pregnant Cows:** Special care is taken to vaccinate pregnant cows, as BVD can cause reproductive losses. Modified live vaccines are often used, but inactivated vaccines are administered to pregnant animals to avoid risks to foetal health.
- **Booster Vaccinations:** Annual and bi-annual boosters are recommended, depending on the regional disease prevalence and the type of vaccine used.

3. Porcine Reproductive and Respiratory Syndrome

PRRS is a viral disease that affects pigs, causing reproductive failure in breeding stock and respiratory disease in young pigs. Vaccination against PRRS is complex due to the virus's high mutation rate. Vaccination protocols include:

- **Vaccination of Sows:** Breeding sows are vaccinated before gestation to reduce the risk of reproductive failures.
- **Weaned Piglets:** Piglets are vaccinated at weaning, typically around 3-4 weeks of age.
- **Continuous Vaccination:** Due to the virus's variability, it is essential to adapt vaccination strategies regularly and monitor herd immunity levels.

4. Peste des Petits Ruminants

Peste des Petits Ruminants (PPR) is a highly contagious viral disease that affects small ruminants, such as goats and sheep. It leads to high morbidity and mortality rates, particularly in young animals. Vaccination against PPR is one of the most effective control measures, and the protocol generally includes:

- **Mass Vaccination Campaigns:** In regions with frequent outbreaks, mass vaccinations are conducted to control the spread of the disease.
- **Annual Vaccination:** Regular vaccination of livestock populations, especially before the start of the rainy season when outbreaks are more common, is recommended.
- **Booster Vaccination:** In areas with a high risk of PPR, booster shots are given every 2-3 years to maintain herd immunity.

5. Newcastle Disease

Newcastle disease is a viral infection affecting poultry, causing significant economic losses worldwide. Vaccination protocols for Newcastle disease involve:

- **Live Vaccines for Chicks:** Day-old chicks are vaccinated with live attenuated vaccines, followed by a second dose at 2-3 weeks.
- **Inactivated Vaccines for Layers:** In commercial layers, inactivated vaccines are administered at 18-20 weeks to boost long-term immunity.
- **Routine Vaccination:** In areas with endemic Newcastle disease, regular vaccination campaigns are conducted to minimize outbreaks.

6. Gumboro / Infectious Bursal Disease (IBD)

Gumboro disease, also known as Infectious Bursal Disease (IBD), is a highly contagious viral infection that primarily affects young chickens, leading to immunosuppression and increased susceptibility to secondary infections. Vaccination remains the most effective method of control.

- **Live Vaccines for Chicks:** Attenuated live vaccines are administered between 10–21 days of age, depending on the level of maternal antibody interference. Intermediate or intermediate-plus strains are selected based on field challenge levels (Van den Berg *et al.*, 2000).
- **Booster Doses:** A booster vaccination is often given 2–3 weeks after the initial dose to ensure strong and uniform protection, particularly in broiler breeders and layers.
- **Monitoring:** ELISA serological tests are used to monitor antibody titers and confirm flock immunity post-vaccination.
- **Biosecurity Measures:** Strict hygiene and disinfection of poultry houses are crucial to reduce virus persistence in the environment

7. Marek's Disease

Marek's disease is a lymphoproliferative viral disease of chickens caused by a herpesvirus, leading to tumors, paralysis, and immunosuppression. It causes significant economic losses due to mortality and reduced productivity.

Day-Old Vaccination: The most effective prevention strategy is vaccination of chicks at the hatchery, typically with cell-associated live vaccines such as CVI988/Rispens, HVT (Herpesvirus of Turkey), or bivalent HVT + SB-1 formulations.

Route of Administration: The vaccine is usually administered subcutaneously at the back of the neck to day-old chicks before exposure to field virus.

Biosecurity: Marek's virus is highly resistant in the environment; therefore, maintaining proper biosecurity and hygiene in poultry houses is essential to complement vaccination efforts.

Vaccine Efficacy: Vaccination prevents clinical disease but does not eliminate infection or viral shedding; hence, continuous monitoring of field strains is important to detect virulent variants.

8. Fowl Pox

Fowl pox is a slow-spreading viral disease affecting chickens and turkeys, characterized by cutaneous lesions on unfeathered areas and diphtheritic lesions in the mouth and upper respiratory tract. The disease is caused by an avipoxvirus and can result in poor growth, decreased egg production, and secondary infections.

Vaccination of Chicks and Growers: Live attenuated fowl pox vaccine is typically administered to chickens between 6–10 weeks of age using the wing-web stab method.

Revaccination: In high-risk or endemic areas, layers may be revaccinated at 16–20 weeks before the onset of lay to maintain immunity throughout production.

Vaccination Check: “Vaccine take” (a small scab formation at the vaccination site within 7–10 days) confirms successful immunization.

Vector Control and Hygiene: Control of mosquitoes and other biting insects, along with strict hygiene, helps reduce transmission and outbreak severity.

9. Contagious bovine pleuropneumonia (CBPP)

Contagious bovine pleuropneumonia (CBPP) is a highly contagious disease of cattle caused by *Mycoplasma mycoides* subspecies *mycoides* small colony. The disease is characterised clinically by severe coughing, weakness, emaciation and sometimes by elevated temperature.

- Vaccine type: Live attenuated (T1/44; T1SR used in some places).
- Target species: Cattle.
- Dose/route/age: 1 mL (standard vial/dose depends on manufacturer) given subcutaneously; vaccinate animals \geq ~6 months old (follow national label).
- Schedule / boosters: T1/44 usually given annually; some programs use T1SR twice yearly. Mass campaigns aim for very high coverage (\geq 80–90%) repeated annually during containment.
- Cold chain/handling: Live vaccine — strict cold chain; reconstitute per manufacturer and use immediately.
- Field notes /cautions: Only vaccinate apparently healthy cattle; coordinate with movement control and surveillance because vaccination alone won't eliminate re-introduction. Record batch/animal ID for traceability.

Considerations for Vaccine Administration

The success of vaccination protocols depends on several factors:

1. Cold Chain Maintenance: Ensuring vaccines are stored and transported at appropriate temperatures is crucial for their effectiveness.
2. Monitoring and Surveillance: Regular monitoring of disease prevalence and post-vaccination immunity levels helps adjust vaccination strategies.
3. Animal Health and Nutritional Status: Vaccines are more effective in healthy, well-nourished animals. Malnourished or stressed animals may not develop adequate immunity.
4. Public Health Integration: Livestock vaccination programs are often integrated with broader public health strategies, especially for zoonotic diseases like brucellosis and rabies, which can be transmitted from animals to humans.

6.3 Vaccination Guidelines for Companion Animals

Vaccination is a critical component of preventive healthcare in companion animals, safeguarding pets from numerous infectious diseases and contributing to public health by preventing zoonotic transmission. Vaccination guidelines for companion animals, including dogs and cats, have been established to provide

a framework for veterinary practitioners to ensure optimal protection while minimizing the risks of over-vaccination. These guidelines are periodically reviewed by veterinary bodies such as the World Small Animal Veterinary Association (WSAVA), American Animal Hospital Association (AAHA) at the international level, and by subject matter experts selected by the Department of Veterinary Public Health and epidemiology of the Federal Ministry of Livestock Development to incorporate the latest scientific advancements and emerging disease threats.

Vaccines for companion animals are categorized into two groups: core and non-core vaccines. Core vaccines are those that are universally recommended for all pets, regardless of their geographical location or lifestyle, as they protect against diseases that are highly contagious, pose a significant risk to the animal's life, or have zoonotic potential. For dogs, core vaccines typically include those for canine distemper virus (CDV), canine adenovirus (CAV), and canine parvovirus (CPV), as well as rabies. For cats, core vaccines usually cover feline parvovirus (FPV), feline calicivirus (FCV), feline herpesvirus type 1 (FHV-1), and rabies.

Non-core vaccines are optional and are recommended based on the pet's risk factors, such as geographic location, lifestyle, or potential exposure to certain pathogens. For instance, leptospirosis, *Bordetella bronchiseptica*, and Lyme disease vaccines for dogs, as well as feline leukemia virus (FeLV) vaccines for cats, are considered non-core but may be recommended based on the pet's circumstances.

The frequency of vaccination is a crucial consideration to prevent over-vaccination while ensuring ongoing protection. Initial vaccination in puppies and kittens typically begins between 6 and 8 weeks of age, followed by boosters every 3 to 4 weeks until the pet reaches 16 weeks of age. A final booster is usually administered at one year of age. Afterward, core vaccines are generally given every three years or as determined by antibody titres. The use of antibody titre testing has gained acceptance as a tool for determining whether revaccination is necessary, particularly for core vaccines, offering a personalized approach to vaccination.

While vaccines are safe and effective for most animals, adverse reactions can occur, though they are typically rare and mild, such as transient swelling at the injection site, mild fever, or lethargy. However, more serious but less common reactions like anaphylaxis, autoimmune disorders, or injection-site sarcomas in cats have been reported. Guidelines recommend veterinarians conduct a thorough risk assessment before vaccinating, considering the pet's age, health status, breed predispositions, and exposure risk, to minimize potential adverse effects.

Vaccination requirements are also influenced by legal regulations, particularly regarding rabies, which is mandated in Nigeria due to its zoonotic nature. Rabies control requires regular vaccination, with booster intervals depending on whether a one-year or one to three-year vaccine is used. Ethical considerations include ensuring that vaccines are used appropriately based on the individual animal's needs and avoiding unnecessary vaccination purely for profit-driven motives.

6.4 Record Keeping and Reporting Vaccine Use

Detailed records of all NEVM prescriptions, including patient details, dosage, duration, and treatment outcomes, should be kept for legal and monitoring purposes. Farms must maintain detailed logs of all medications administered, including withdrawal periods and treatment outcomes. These records should be regularly audited by veterinary authorities.

CHAPTER SEVEN

7. Use of Antiparasitic Agents

Anti-parasitic agents are essential tools in the management of parasitic diseases in livestock, poultry and aquaculture. They target both internal and external parasites, improving animal health, productivity, and food safety. However, their use must be carefully managed to prevent the development of resistance and ensure their continued efficacy. This section outlines key strategies for controlling both internal and external parasites, implementing strategic deworming programs, and addressing parasite drug resistance.

7.1 Control of Internal Parasites in Livestock

Internal parasites, including gastrointestinal nematodes, liver flukes, and lungworms, are a significant cause of morbidity and productivity loss in livestock. Effective control measures typically involve the use of anthelmintics. The choice of anthelmintic, treatment frequency, and administration route depends on factors such as parasite species, environmental conditions, and livestock management practices. Common classes of anthelmintics include benzimidazoles, macrocyclic lactones, and imidazothiazoles. Benzimidazoles (albendazole, fenbendazole) work by inhibiting the parasite's microtubule formation, leading to death. Macrocyclic lactones (ivermectin, moxidectin) paralyze and kill parasites by disrupting the functions of their nervous systems. In addition to using anthelmintics, rotational grazing and pasture management can reduce parasite burdens. For instance, rotating pastures helps break the lifecycle of parasites by limiting exposure to infective larvae. Effective internal parasite control is crucial for maintaining animal health and enhancing production outcomes, including weight gain, milk production, and reproductive performance.

7.2 Management of External Parasites

External parasites, including lice, ticks, mites, fleas, and flies, can cause severe discomfort to terrestrial and aquatic animals and act as vectors for diseases. The management of external parasites involves the use of ectoparasitic agents, which are applied topically, orally, or via injection to control and eliminate infestations. Popular classes of ectoparasitic agent include organophosphates, pyrethroids, and macrocyclic lactones. Pyrethroids are widely used due to their broad-spectrum activity against arthropods, including ticks and lice. They disrupt the parasite's nervous system, leading to paralysis and death. Integrated Pest Management (IPM) combines chemical treatments with biological control methods and environmental modifications. For example, introducing natural predators (dung beetles) or using fly traps can help reduce fly populations without heavy reliance on chemical agents. Routine inspections and treatment programs based on the seasonal activity of external parasites can prevent infestations from becoming severe. Prophylactic treatments may be necessary during high-risk periods, such as the warm months when ticks and flies are more active.

7.3 Strategic Deworming Programs

Strategic deworming programs aim to target parasites at specific points in their lifecycle and during critical periods when animals are most vulnerable to infection. The goal is to minimize parasite burdens, prevent reinfection, and avoid the development of resistance. Strategic deworming focuses on treating animals when parasite levels are expected to be high. For example, young animals are often dewormed during weaning or after being introduced to new pastures. Deworming at these times reduces the overall parasite load and protects the animal during periods of stress. Faecal Egg Counts (FEC) testing is used to monitor parasite burdens and determine the need for treatment. By identifying animals with high faecal egg counts, farmers can adopt a more targeted deworming approach, treating only those animals that require intervention. Strategic deworming programs also take into account the seasonal variation in

parasite populations. For instance, during cold weather deworming is often timed to reduce parasite transmission when conditions are favourable for parasite development.

7.4 Parasite Resistance and Control Measures

Parasite resistance to anti-parasitic agents, particularly anthelmintics, is an increasing global problem. Resistance develops when parasites survive treatment and pass on their drug-resistant genes to offspring, making future treatments less effective. To combat resistance, integrated control measures are essential. Resistance has been reported in several parasite species, including *Haemonchus contortus* in sheep and *Ostertagia ostertagi* in cattle. Factors contributing to resistance include the overuse of anthelmintics, underdosing, and the practice of administering frequent, blanket treatments without testing for parasite load. Rotating between different classes of anthelmintics can help slow the development of resistance. For example, alternating between macrocyclic lactones and benzimidazoles ensures that parasites are exposed to drug molecules with different modes of action, reducing the chance of resistance. “The concept of refugia” involves leaving a portion of the parasite population unexposed to treatment, typically by not deworming a small percentage of the herd. This preserves a pool of drug-susceptible parasites that dilutes the resistant population. Using a combination of anthelmintics with different mechanisms of action has been shown to improve efficacy and delay resistance. Combination therapy reduces the chances of any single parasite surviving treatment.

CHAPTER EIGHT

8.0 Pain Management and Anti-Inflammatory Drugs

Pain management and the use of anti-inflammatory drugs are essential aspects of veterinary care, promoting the welfare of animals by minimizing discomfort, reducing inflammation, and facilitating recovery. Different classes of drugs, including Non-Steroidal Anti-inflammatory Drugs (NSAIDs) and corticosteroids, are used across a variety of species, from farm animals to companion pets. Each drug class has its applications, benefits, and potential side effects, which are considered when creating pain management protocols.

8.1 Managing Pain and Inflammation in Farm Animals

Pain and inflammation in farm animals, such as cattle, sheep, pigs, and poultry, can result from various conditions, including surgical procedures (such as castration or dehorning), injury, disease (such as mastitis or lameness), and transport stress. Effective pain management not only improves animal welfare but also enhances productivity by mitigating the negative effects of pain on feed intake, growth rates, and reproductive performance. Pre-emptive use of analgesics is often employed before surgical procedures like castration, disbudding, and tail docking to reduce pain at its source. Local anaesthetics, such as lidocaine, are used alongside systemic pain relief measures such as NSAIDs. Combining drugs that target different pain pathways is a preferred strategy. For example, NSAIDs may be administered along with opioids or local anaesthetics to manage both acute and chronic pain. Different countries have established guidelines for the mandatory use of analgesics during certain painful procedures. For instance, in some regions, pain relief is mandatory during the dehorning of cattle.

8.2 Use of NSAIDs and Steroidal Drugs

Non-steroidal anti-inflammatory Drugs (NSAIDs) and steroidal drugs are the mainstay of pain and inflammation control in veterinary medicine. Both have distinct mechanisms of action and are chosen based on the type and duration of inflammation, as well as the species involved. NSAIDs work by inhibiting cyclooxygenase (COX) enzymes (COX-1 and COX-2), which are involved in the production of prostaglandins, substances that mediate inflammation and pain. Drugs such as flunixin meglumine, meloxicam, and carprofen are widely used in farm animals to treat acute pain and inflammation resulting from conditions like mastitis, lameness, and post-surgical discomfort. While effective, NSAIDs can cause gastrointestinal ulcers, kidney damage, and impaired wound healing when used long-term or in high doses. Thus, their use is carefully monitored.

Steroidal anti-inflammatory drugs, primarily corticosteroids (e.g., dexamethasone, prednisone), suppress the immune system and inflammation by inhibiting phospholipase A2 and reducing the production of inflammatory mediators. These drugs are highly effective for reducing severe inflammation but are used sparingly due to risks of immunosuppression, delayed wound healing, and metabolic changes. They are generally reserved for more severe conditions, such as autoimmune diseases or extreme allergic reactions.

8.3 Pain Relief in Companion Animals

Companion animals, such as dogs and cats, benefit from well-developed pain management protocols to ensure their quality of life, especially after surgery, injury, or in cases of chronic conditions like arthritis. After surgical procedures like spaying, neutering, or dental surgeries, veterinarians typically administer NSAIDs or opioids to manage acute pain. NSAIDs such as carprofen and meloxicam are commonly used in dogs, while cats are treated with lower doses of these drugs due to their unique metabolic pathways. For long-term conditions like osteoarthritis, NSAIDs remain the cornerstone of therapy, often combined with supplements like glucosamine and chondroitin to enhance joint health. Physical therapy and weight management are also integral to managing chronic pain in pets. In animals, signs of pain may include reduced mobility, changes in appetite, and aggression. Pain assessment scales, such as the Glasgow

Composite Pain Scale, are frequently used to evaluate the level of pain in pets and adjust treatment accordingly.

8.4 Guidelines for Post-Operative Pain Management

Post-operative pain management is a critical component of animal care, promoting faster recovery and reducing the risk of complications such as self-inflicted injury or chronic pain. Effective protocols involve multi-modal analgesia to address different pain pathways and ensure comprehensive relief. Administering pain relief before surgery can help minimize the pain, thereby reducing post-operative discomfort. After surgery, NSAIDs and opioids are commonly used to control pain. Opioids such as buprenorphine or fentanyl are favoured for severe pain, while NSAIDs manage moderate pain and inflammation. In some procedures, local anaesthetics (bupivacaine) are administered at the surgical site to numb the area and provide extended pain relief post-operatively. Post-operative care includes regular monitoring of vital signs and behaviour to adjust pain management as needed. For long surgeries or in older animals, continuous rate infusions (CRI) of pain medications may be used.

8.5 Guidelines for Use of Veterinary Medicines in Euthanasia

Euthanasia in veterinary practice must be conducted humanely, ensuring minimal distress and pain to the animal, while prioritizing animal welfare, safety for personnel, and ethical considerations. In Nigeria, there is no specific law governing euthanasia; however, it is guided by ethical principles embedded in veterinary regulations and the Animal Disease Control Act 2022. Veterinarians should follow international standards such as the AVMA Guidelines for the Euthanasia of Animals.

Key principles include:

- A. Indications: Euthanasia is appropriate for terminally ill animals, those with untreatable suffering, severe behavioural issues posing risks, or in disease control (e.g., rabies). It should only be considered when alternatives, such as treatment or rehoming, are unfeasible.
- B. Methods: Preferred methods involve injectable agents like pentobarbital (intravenous or intraperitoneal) for rapid, painless unconsciousness and death. Physical methods (e.g., captive bolt for livestock) may be used in emergencies, but they require expertise to ensure humane treatment. CO₂ inhalation for small animals or rodents must follow concentration and exposure guidelines to avoid distress.
- C. Procedure: Obtain owner consent (written where possible), ensure a calm environment, use sedation if needed (e.g., xylazine or acepromazine), and confirm death via absence of heartbeat, respiration, and reflexes. For food animals, ensure compliance with applicable residue regulations.
- D. Ethical and Legal Considerations: Euthanasia must be performed by licensed veterinarians or trained personnel. In Africa, including Nigeria, cultural sensitivities and limited resources may pose challenges; therefore, education on humane methods is essential. Report zoonotic cases to authorities. The disposal of remains should prevent environmental contamination, in accordance with NAFDAC guidelines. Veterinarians should undergo training in euthanasia techniques and provide grief support to owners.

CHAPTER NINE

9.0 Reproductive Health Medicines and Practices

Reproductive health medicine and practices encompass all phases of breeding services, including artificial insemination for a variety of large and small animal patients, advanced assisted reproductive techniques, breeding soundness evaluations of males and females, obstetrics, management of diseases or complications of the postpartum period, and medical or surgical management of diseases of the male and female reproductive tract. All veterinarians are expected to use their skills in providing acceptable reproductive health management protocols.

These should include thorough physical examination (Breeding soundness), laboratory investigations, artificial insemination with fresh, chilled, or frozen semen, high-risk pregnancy management, caesarean-section timing and management, as well as other diagnostic aids to provide a standard and acceptable reproductive health system.

9.1 Hormonal Treatments for Oestrus Synchronisation

Hormone therapy in oestrus synchronisation refers to the use of hormones to alternate oestrus in both livestock and companion animals. However, their usage may not be achieved if standard protocols are not adhered to. There are different hormones used for the synchronisation of oestrus in Nigeria which are readily sold in commercial quantities. Their dosages, mode of administration and actions are provided by their manufacturers (Refer to the Veterinary Medicine Essential Drug lists). The NEVMs guidelines require that the use of hormonal therapy for oestrus synchronisation should be under the supervision of skilled veterinarians, on healthy animals, using compatible species/breeds and in accordance with the rules and regulations.

9.2 Medications for Reproductive Disorders

Various drugs used in the management of disorders associated with reproductive health are often naturally occurring hormones or chemical modifications of hormones. These are often used to induce or suppress oestrus; some are also used to stimulate testicular function or sperm production. Some of the more commonly used hormones include gonadotropin-releasing hormone and related drugs, follicle-stimulating hormone, human chorionic gonadotropin, equine chorionic gonadotropin, oestradiol compounds, progesterone and synthetic progestins, testosterone, and prostaglandins. Another hormone, oxytocin, is used to promote milk production and letdown, as well as to induce uterine contractions to either initiate labor or enhance uterine contractions after birth.

9.3 Assisted Reproductive Technologies (ART)

Assisted Reproductive Technologies (ART) are currently used in animals usually in three main situations:

- I. As a form of treatment for subfertility and infertility in females and/or males,
- II. As a method to obtain genetically valuable progeny in a relatively short time in healthy fertile animals,
- III. As a modern smart tool to obtain progeny in endangered animal species in programs of rescue of wild animals threatened with extinction.

Generally, the efficiency of reproductive biotechniques in companion animals is lower compared to what is achieved in farm animals. Independent of the aim of their use, there are some techniques that are better developed in companion animals than in livestock. It can be assumed that simple, clinical techniques are well-established and more frequently used. The level of effectiveness of ART is conditioned by anatomical and physiological factors specific for species, general demands for their use in veterinary practice and research, and general interest of breeders and scientific community.

9.4 Ethical Considerations in Reproductive Interventions

Reproductive interventions in animals, such as artificial insemination, embryo transfer, genetic modification, and cloning, play a crucial role in animal breeding, agriculture, and conservation efforts. While these technologies offer significant benefits in terms of productivity, species preservation, and the improvement of genetic traits, they also raise ethical concerns. The ethical considerations in reproductive interventions focus on animal welfare, the integrity of species, environmental impacts, and the social and economic implications of these technologies.

CHAPTER TEN

10. Storage, Handling, and Disposal of Veterinary Medicines

All NEVMs drugs on the farm must be stored in cool dry places with low relative humidity and at temperatures not exceeding 25 °C. This is very important especially in the case of powdery preparations that deteriorate fast in poor storage conditions. Drugs/Vaccines must be stored away from direct sunlight as this may have adverse effects on the colour, viscosity, and may even lead to reduced potency or outright damage.

Handling of all NEVMs will require the use of professionals who understand the knowledge of handling, transporting, distributing, and to a large extent, the administration of such essential veterinary medicines. Drug transportation from the point of manufacture and sales of chemicals or drugs for use on the farm will ensure that the containers are in an upward position, well arranged in cartons, and not stacked. Where they are being transported in a public van, the carton should have a bold inscription “Fragile, handle with care”. It is also advisable to notify your driver at the outset what you are carrying and your right to carry such medicine in case of inquiries by regulators and other law enforcement agents. However, the most important benefit of these aforementioned measures is to ensure that medications are safe to administer to the animals.

The NEVMs regulations are expected to change in the near future, with a public consultation and as part of that consultation, animal health companies are exploring ways to reduce the volume of packaging provided with Veterinary Medicinal Products (VMPs). The abnormal disposal of veterinary medicines must be avoided to improve the sustainability of the animal health sector. By implementing best practices for disposing of veterinary medicinal products, the health of humans, animals, and the environment can be safeguarded. It is also essential that veterinarians and animal owners refer to product packaging to ensure they are aware of any warnings or precautions related to both the safe use and disposal of the product, as well as the associated packaging.

10.1 Storage Conditions for Different Categories of Drugs

All NEVMs must be stored under proper conditions (temperature, humidity, etc.) as per the manufacturer's recommendations. This includes refrigeration for vaccines and some drugs. Practices must implement inventory control to prevent overstocking and ensure medications are used before their expiration dates. Medicines should be handled by trained personnel to ensure proper preparation and administration, particularly for injectable and hazardous drugs.

10.2 Expiry Date Monitoring and Inventory Management

Animal diseases are a danger to livestock, businesses, and public health. This is why the public and private sectors worldwide have invested significantly in the manufacture and distribution of veterinary drugs. However, veterinary drug supply chain actors still incur losses due to expiration. Besides, the way expired products are managed might pose risks to human, animal, and environmental health. All NEVMs are expected to be monitored from the point of supply, stocking as they are supplied until they are exhausted or expired.

10.3 Safe Disposal of Unused or Expired Medicines

Expired or unused medicines should be disposed of in an environmentally safe manner. Farmers and veterinarians should follow NAFDAC guidelines for the disposal of veterinary waste to prevent environmental contamination. Care should be taken to prevent contamination of the environment with veterinary medicines, particularly antibiotics and pesticides, which could affect the environment and water sources.

CHAPTER ELEVEN

11.1 Overview of ADR in Veterinary Medicine

In veterinary practice, ADRs refer to unintended or harmful effects of drugs when administered at normal doses for therapeutic purposes. The spectrum of ADRs in animals ranges from mild, such as minor allergic reactions, to severe, including organ damage, reproductive harm or death. ADRs can arise from various drug classes, including antibiotics, anti-inflammatory agents, and anaesthetics. Animals metabolize drugs differently, leading to species-specific reactions. For example, cats may show sensitivity to drugs that dogs tolerate well due to differences in liver enzymes. Drugs are sometimes used Extra-label in veterinary medicine, especially in cases where no approved drug exists for certain conditions in specific species, increasing the risk of ADRs. Animals receiving multiple medications simultaneously may be at higher risk for drug interactions and ADRs. The monitoring of ADRs is crucial to early identification of potentially harmful side effects, ensuring drug safety, and informing both veterinarians and regulatory bodies about necessary interventions.

11.2 Establishing a Reporting System for ADR

A robust ADR reporting system in veterinary medicine involves several components: Veterinarians are often the first to observe ADRs. They must be encouraged to report any suspected reactions to relevant authorities or manufacturers. Reporting should include detailed information on the animal species, drug dosage, duration of treatment, observed side effects, and treatment outcomes. Many countries have implemented veterinary pharmacovigilance systems to collect, evaluate, and analyse ADR reports. These systems play a crucial role in post-market drug surveillance, informing regulatory decisions. Animal owners and handlers should also be educated about ADRs and encouraged to report any unusual reactions they observe in their animals to their veterinarians. Establishing a reliable, transparent, and accessible reporting system is fundamental to reducing the incidence of ADRs and improving drug safety in veterinary practice.

11.3 Handling Drug Failures and Side Effects

When ADRs or drug failures occur, it is crucial to have protocols in place for handling these situations effectively. Veterinarians must assess the severity of the ADR and take immediate corrective actions, such as discontinuing the drug, providing supportive care, or switching to an alternative medication. The type of intervention depends on the nature and severity of the reaction. Instances where a drug fails to produce the expected therapeutic effect should also be reported. This may involve therapeutic drug monitoring to check whether appropriate drug levels were achieved or if other factors, such as drug interactions or incorrect dosages, contributed to the failure. Continuous monitoring of the animal after an ADR is essential to prevent long-term complications or additional reactions. Follow-up care often includes adjusting dosages, modifying treatment plans, or managing side effects through supportive therapies. Handling drug failures and side effects requires not only treating the individual animal but also documenting the event to prevent future incidents and contribute to the improvement of veterinary therapeutics.

11.4 Adapting Treatment Based on ADR Reports

ADR reports serve as critical feedback for veterinarians, regulatory agencies, and pharmaceutical companies to refine treatment protocols and enhance drug safety. If ADRs are frequently reported at certain dosage levels, adjusting the recommended dosages for specific species or conditions may be necessary to minimize the risk. ADR data can inform pharmaceutical companies in the development of new or modified drug formulations that offer safer profiles for animals. For instance, drugs may be

reformulated to reduce toxicity or improve bioavailability. National and international regulatory agencies may adapt their policies based on ADR reporting, such as adding warnings to drug labels, restricting usage in certain species, or withdrawing the drug from the market if significant risks are identified. By continually integrating ADR reports into veterinary practice, the profession can evolve toward safer and more effective treatments, ultimately improving animal welfare and public health outcomes.

11. Monitoring and Reporting Adverse Drug Reactions

Adverse Drug Reactions (ADRs) in veterinary medicine are critical to ensuring the safety and efficacy of drugs used in animals. Monitoring and reporting ADRs help protect animal health, ensure public safety (especially for zoonotic diseases), and support ongoing improvements in veterinary pharmacology. Developing systematic protocols for reporting, handling drug failures, and adapting treatments based on ADR reports is essential to achieving these objectives.

As recommended:

1. Report ADRs to:
 - FDVPCS
 - VCN
 - NAFDAC PV department
2. Investigate:
 - Treatment failures
 - Suspected counterfeit medicines
3. Use NEVML to evaluate whether correct medicine was used.

CHAPTER TWELVE

12. Training and Education in the Use of NEVM

The Nigeria Essential Veterinary Medicines List (NEVML) has become pivotal in the management of animal health and the control of diseases in livestock and companion animals. The development of EVML, such as novel vaccines, antibiotics, and biologics, requires proper training and education to ensure veterinary professionals can maximize their benefits while mitigating risks, including drug resistance and improper use.

12.1 Ongoing Training for Veterinarians and Para-Veterinarians

Continuous professional development (CPD) for veterinarians and support staff on the safe and effective use of NEVMs must be mandatory. Training should cover new medications, updated protocols, and emerging disease threats.

Institutions should use NEVML to:

1. Teach rational drug use.
2. Train field veterinarians on AMR mitigation.
3. Develop CPD modules on:
 - Vaccination
 - Responsible antimicrobial use
 - Antiparasitic resistance
 - Drug quality assurance

12.2 Farmer Education and Awareness Programs

Training programs for farmers should be conducted to educate them on the importance of adhering to veterinary guidance, ADRs, proper drug handling, and the risks of self-medicating animals without professional advice.

12.3 Public Health and Food Safety Training

In view of the fact that Veterinary Medicinal Products are of public health importance, it's expedient to ensure veterinarians and public health experts are continuously being trained to ensure safety. This could be achieved during undergraduate as well as postgraduate training.

12.4 Integrating One Health Concepts in Veterinary Education

The One Health concept in veterinary Education is germane and should be integrated into veterinary education to ensure we meet the international standards.

CHAPTER THIRTEEN

13.0 Compliance and Enforcement

Veterinarians and livestock managers must be educated about the legal and ethical aspects of using NEVM. These include:

- **Regulatory Standards:** Different regions have varying regulations on the approval and use of NEVM. Professionals need to be familiar with these rules to ensure compliance with national and international standards, such as those from the Food and Drug Administration (FDA), European Medicines Agency (EMA), or World Organisation for Animal Health (WOAH).
- **Ethical Prescribing Practices:** Beyond legal requirements, veterinarians must adhere to ethical standards when prescribing NEVM. This includes considering the welfare of the animal, the safety of food products for consumers, and the broader ecological impact of drug use, especially antibiotics and parasiticides.

Training programs often include case studies and scenarios to highlight the consequences of non-compliance or unethical practices. Online certifications and courses that focus on regulatory requirements are becoming a common part of continuing education for veterinary professionals.

13.1 Essential Veterinary Medicine Regulation Compliance

Veterinary Medicines are available only in Veterinary Hospitals, Clinics, and Pharmacies. They are to be well-maintained, adhering to the storage instructions on the label to ensure potency safeguards. Compliance would be achieved by proper monitoring of the premises where these medicines are stored and used

13.2 Penalties for Non-Compliance

Non-compliance should be heavily sanctioned to serve as a deterrent to those who default. This should include payment of a fine, sealing of premises, and withdrawal of licence in the event of incessant defaulters as enshrined in the Animal Disease Control Act 2022, as amended, and the Food and Drugs Act 2022, in collaboration with relevant government agencies.

13.3 Role of Veterinary Inspectors

Veterinary inspectors are officers assigned to conduct inspections of veterinary facilities with the view of registration or its renewal with the regulatory bodies for compliance as well as ensuring the standards are maintained.

13.4 Reporting Violations

There should be a reporting mechanism that tracks the consumption and use of essential veterinary medicines. Existing reporting structures on the ground can be leveraged and collaboratively work with NAFDAC and other related agencies. Anyone found violating the laid-down rules of engagement should be reported. The report should go to the Chief Veterinary Officer of the State, who would, in turn, ensure the necessary actions are taken to forestall such an occurrence in the future.

CHAPTER FOURTEEN

14.0 Conclusion and Future Directions

14.1 Summary of Key Principles

Laws are meant to be obeyed; medicines are effective and efficacious when used according to laid-down rules and guidelines. Medicines work by all or none principles and, as such, must be used ethically to avoid inappropriate use and prevent resistance.

14.2 Future Challenges and Considerations

Knowledge is dynamic; this document will be reviewed periodically to improve its content. As such, relevant feedback would be appropriate as this document is being put to use.

14.3 Role of Emerging Technologies in Veterinary Medicine

Artificial intelligence (AI) is fast becoming a veritable tool in science. Veterinary medicine is not left out, however, it's important to use AI and other emerging technologies alongside previous ones to help track consumption and use of essential medicines within the animal health sector.

14.4 Moving Toward Sustainable Veterinary Practices

Sustainable veterinary practices are crucial for addressing the growing challenges in animal healthcare, environmental protection, and public health. As the veterinary sector evolves, it is increasingly important to adopt strategies that minimise environmental impact, promote animal welfare, and contribute to sustainable agriculture. This shift involves integrating eco-friendly practices, responsible use of pharmaceuticals, and supporting ethical farming systems that align with the broader goals of sustainability.

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21.	Dr. Adah Ogwuche Ogwuche	Zoetis/Association of Ruminant Veterinarians in Nigeria (ARUVIN)
22.	Dr. Moses Mareako Eki	M & M Vet Consult
23.	Dr. Mohammed Adamu Uba	Blueblood Veterinary Hospital, Abuja
24.	Dr. Onuche Shalom Agweche	Integrated Dairies Limited
25.	Dr. Adeyinka Olamide Agbato	Animal Care Services Konsult Nig Ltd
26.	Dr. Sabuwa Abubakar Muktar	Nigerian Veterinary Medical Association
27.	Dr. Aisha Usman Bagudu	Federal Ministry of Livestock Development
28.	Dr. Emuesiri Kohworho Umukoro	Delta State University
29.	Dr. Shuaibu Saidu Gatawa	Ministry of Animal Health and Fisheries Development, Sokoto
30.	Dr. Anderi Tukura Ira	Tosam Integrated Services Limited
31.	Dr. Emmanuel Mshelia Wayuta	Ambuvets Konsult Ltd.
32.	Dr. Asinamai Athliamai Bitrus	University of Jos