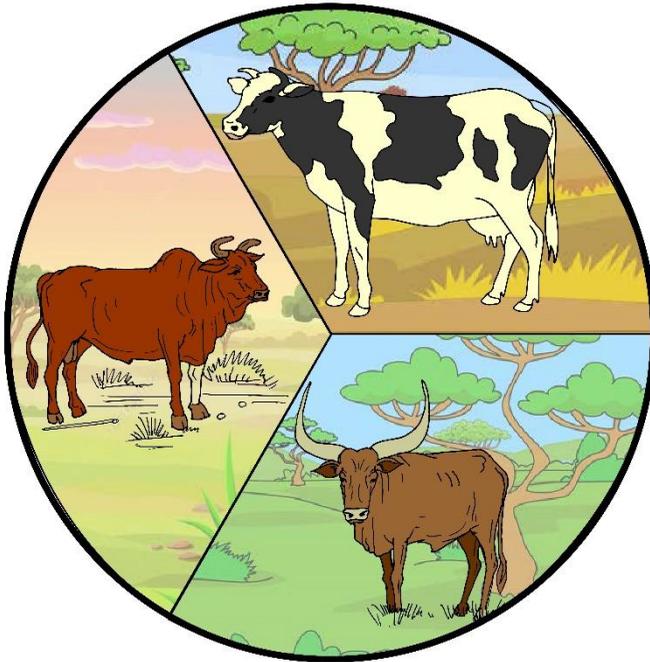




GUIDELINES FOR INFECTION PREVENTION AND APPROPRIATE ANTIMICROBIAL USE IN THE ANIMAL SECTOR:

Cattle Farming



Cover page – Pictures of the common breeds of cattle in Uganda, namely, Fresian (top), Ankole (bottom), and Zebu (left) cows.

*Art illustrations in this guide were done by Godfrey Toskin, Lochart (Uganda) Limited
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Guidelines for Infection Prevention and Appropriate Antimicrobial Use in Animal Sector: Cattle Farming

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FOREWORD

Welcome to the first edition of the *Guidelines for Infection Prevention and Appropriate Antimicrobial Use in the Animal Sector*. This edition focuses on five livestock production systems, namely cattle farming, fish farming, goat and sheep farming, pig farming, and poultry farming. We trust that these operational guidelines will be valuable for farmers and frontline veterinary practitioners.

The Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) is grateful to the Directorate of Animal Resources, and particularly the Department of Animal Health, for completing this task. We also thank the technical team of Dr. Dominic Mundrugo-ogo Lali, Dr. Patrick Vudriko, and Dr. Freddy Eric Kitutu for the technical support, as well as Makerere University and the USAID-funded Medicines, Technologies and Pharmaceutical Services (MTaPS) Program, implemented by Management Sciences for Health (MSH), for the material, technical, and financial support for this output.

Indeed, these guidelines play an important role in implementing the Uganda National Antimicrobial Resistance National Action Plan to slow the spread of resistant microbes. Around 75% of emerging resistant pathogens are related to zoonotic care. Taking steps to ensure the livestock industry improves its use and management of antimicrobials reinforces our commitment to strengthening the country's capacity for global health security—a goal that can only be achieved through a concerted effort focused on health management at the interface between human and animal health.

Farmers in Uganda will play a critical role in promoting food safety and security, improving household incomes, and promoting animal and environmental welfare. These guidelines are intended to help farmers:

- Understand strategies for infection prevention and appropriate antimicrobial use;
- Establish practices for recordkeeping of herds and medicinal products used.

- Better understand the need for withdrawal periods for cases in which animals are justifiably given antimicrobials.

A handwritten signature in black ink, appearing to read 'V. Ssempijja', written in a cursive style.

Vincent Bamulangaki Ssempijja (MP)

**Minister of Agriculture Animal Industry and Fisheries,
Republic of Uganda.**

PREFACE

Farmers and frontline veterinary practitioners offer essential services that sustain food security, food safety, and the livelihoods of many households. The rising tide of resistant microbes, zoonoses and transboundary diseases has laid a foundation for pressure from key actors to restrict use of antimicrobial agents in the animal sector. It is, therefore, imperative that farmers and frontline veterinary practitioners demonstrate a responsible approach to the use of antimicrobial medicines in livestock production systems.

This is the first edition of the *Guidelines for Infection Prevention and Appropriate Antimicrobial Use in the Animal Sector*. It is envisaged that these guidelines will be widely disseminated and used, and that they will become a useful resource for farmers and frontline veterinary practitioners. They are written in a manner that allows easy and rapid access to vital information under three themes: infection prevention practices, appropriate antimicrobial use practices, and recordkeeping for farm animals and veterinary medical products on the farm.

These guidelines are intended to help create farming conditions that prevent or minimize the occurrence and spread of infections and to promote the effective and safe use of drugs. Appropriate antimicrobial use, also referred to as prudent or responsible use in the animal sector, is the scientific and technically directed use of these compounds which should form an integral part of good veterinary and animal husbandry practices. Recommendations and practical measures of infection prevention, such as vaccination and improvement in husbandry conditions, should be encouraged and prioritized as a core intervention to slow down the spread of antimicrobial resistance (AMR). Infection prevention, if well implemented, will reduce or even eliminate the use of antimicrobial agents, which in most cases are used as an alternative for deficient animal husbandry practices.

All the relevant government ministries, departments, and agencies—including the MAAIF, the National Drug Authority (NDA), the Uganda Wildlife Authority (UWA), and other parastatals—must apply and promote these principles. Veterinarians and other veterinary

practitioners, pharmaceutical actors, and livestock keepers are also expected to apply these principles.

It has been no small task to propose and develop this first edition of the guidelines by summarizing the most current and relevant literature. The MAAIF Directorate of Animal Resources is enormously grateful to the technical team of Dr. Dominic Mundrugo-ogo Lali, Dr. Patrick Vudriko, and Dr. Freddy Eric Kitutu, as well as Makerere University and the Medicines, Technologies, and Pharmaceutical Services (MTaPS) Program, implemented by Management Sciences for Health, for their work in producing this first edition.

These guidelines are one of many technical documents produced by MAAIF in line with global and national aspirations to optimize use of antimicrobial agents in the animal sector as a key strategy to slowing down the spread of AMR. These guidelines will be available as a downloadable PDF document. However, we are also aware that many people would rather have a book and flip through the pages to easily find the information they need. We want to ensure the dissemination of this crucial knowledge is inclusive.

Therefore, these guidelines will be available in both formats—as a hard copy and as an electronic version. The electronic version enables updates and additions to be made without the need to wait for the next edition to come to print. Thus, the guidelines will, in an “active sense,” inform farmers and veterinary practitioners and continue to play their part in reducing infections, reducing unnecessary antimicrobial use, and, consequently, slowing the spread of resistant microbes.



Dr. Juliet Sentumbwe

Director Animal Resources

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Republic of Uganda.**

ACKNOWLEDGEMENT

The *Guidelines for Infection Prevention and Appropriate Antimicrobial Use in the Animal Sector* were produced by the Uganda MAAIF with financial support from the Medicines, Technologies, and Pharmaceutical Services (MTaPS) Program, implemented by Management Sciences for Health. Makerere University (Mak) provided technical support in the process.

We hereby thank the USAID/MTaPS program for their financial support in developing these guidelines. The MAAIF Department of Animal Health, Directorate of Animal Resources, gratefully acknowledges the technical assistance, guidance, and constructive comments provided by all stakeholders during the development process.

We also extend sincere gratitude to all other government agencies (UWA, NDA UWEC, and NARO) who cooperated extensively to make sure the development of these guidelines occurred comprehensively and ensured that the final guideline document is in line with national and international standards.

I participated in crafting the *Guidelines for Infection Prevention and Appropriate Antimicrobial Use in the Animal Sector* and had the pleasure of working with the following talented individuals, from inception to final editing.

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We also thank Makerere University College of Veterinary Medicine, Animal Resources, and Biosecurity (MakCOVAB) Makerere University School of Public Health (MakSPH), Pharmacy Department (MakPD), School of Health Sciences; Makerere University College of Health Sciences (MakCHS); the Uganda Veterinary Association (UVA) and Uganda Veterinary Board (UVB) for their tireless efforts in the review, finalization, and printing of the Guidelines for Infection Prevention and Appropriate Antimicrobial Use in the Animal Sector.

A handwritten signature in blue ink, consisting of several overlapping loops and strokes, likely belonging to Dr. Anna Rose Ademun Okurut.

Dr. Anna Rose Ademun Okurut (PhD)

Commissioner Animal Health

Ministry of Agriculture Animal Industry and Fisheries.

Republic of Uganda.

ABBREVIATIONS

AMR	antimicrobial resistance
DVO	district veterinary officer
FAO	Food and Agriculture Organization
FVE	Federation of Veterinarians of Europe
ILRI	International Livestock Research Institute
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
MSH	Management Sciences for Health
MTaPS	Medicines, Technologies, and Pharmaceutical Services
RUMA	Responsible Use of Medicines in Agriculture Alliance

DEFINITIONS

Administration: In medical terms, refers to giving medicine to an animal/fish.

Antimicrobial agent: Drugs, chemicals, or other substances that kill, inactivate, or slow the growth of microbes, including bacteria, viruses, fungi, and protozoa. Because of these properties, antimicrobial agents are used in treatment and infection prevention in animal health and production.

Antimicrobial resistance (AMR) The ability of microbes to grow in the presence of substances that previously used to kill them.

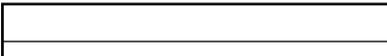
Appropriate medicine use: The selection of the proper drug to be administered according to a dosage regimen appropriate to the sick animal after due consideration of the potential benefits and risks of that therapy. This is also referred to as prudent or responsible medicine use. “Appropriate medicine use” is now the preferred term, replacing the previously common “rational medicine use.”

Biosecurity: The implementation of a series of basic management practices to prevent the introduction¹ and spread² of microbes and diseases within and between farm (s).

Colostrum: The initial milk secreted by animals following parturition (birth) that is rich in nutrients and antibodies and boosts the immunity of a newborn animal.

Diagnosis: The art and science of identifying disease-causing germs and parasites by observation, examination, or use of medical devices and laboratory tests.

Disinfectant: Any substance which is mainly used on non-living objects/surfaces to kill microorganisms that cause infection and disease.



¹ Agriculture Victoria. A practical approach to beef herd biosecurity. Updated 2020 June 22 [cited 2020 June 27]. Available from: <https://agriculture.vic.gov.au/livestock-and-animals/beef/biosecurity/a-practical-approach-to-beef-herd-biosecurity>

² Mayega, L., Dione, M.M., Kawuma, B., et al. Pig management: Ensuring appropriate husbandry practices for profitability: Uganda smallholder pig value chain capacity development training manual. ILRI Manual 15. 2015.

Disinfection: The process of cleaning a surface with a chemical (disinfectant) to destroy microorganisms.

Extra-label use: The use of drugs in ways that are not in accordance with the manufacturer's label and package insert. Extra-label use can only be authorized by a veterinary practitioner who takes full responsibility for such use. Veterinary practitioners must inform clients if a product is being used in such cases.

Footbath: A bath for disinfecting feet, placed at the entrance of the farm or other physically separated places.

Hatchery: A place where eggs of fish and birds (poultry) are hatched under artificial conditions.

Husbandry: The care, cultivation and breeding of crops and animals. These guidelines focus on animal husbandry where animals are raised for meat, fiber, milk, eggs, and other products.

Infection: When an organism (usually a microbe or germ) enters another organism's body (e.g., bird, fish, cow, or other animal) and causes disease.

Medicine: A natural or synthetic substance used to prevent or treat disease or maintain health in animals. This substance can be drenched, injected, applied, or smeared on any part of the animal.

Microbe: Disease-causing germs that cannot be seen with naked eyes. They are also referred to as microorganisms and include bacteria, fungi, viruses, and protozoa.

Parasite: An organism that lives and feeds on an animal. Parasites may cause physical injury and/or spread disease-causing microbes (germs).

Pest: A destructive arthropod or other animal that attacks livestock, including flies, ticks, mice, rats, and birds.

Vector: An organism that transmits a disease or parasite from one animal to another.

Quarantine: A state, period, or place of isolation or confinement in which animals are placed after transport from another place or after exposure to an infectious or contagious disease. It separates or restricts the movement of those animals to see if they become sick.

Veterinary pharmacy/drug shop: A place where medicinal products, medical devices and diagnostics for animals are sold. A licensed pharmacy or drug shop must have a valid license that is displayed where it can be seen.

Veterinary practitioner: A person who is licensed by the Uganda Veterinary Board to practice veterinary medicine in Uganda, e.g., a veterinary surgeon or doctor and veterinary paraprofessionals.

Withdrawal period: The minimum time required between the last treatment and the collection of meat or milk for human consumption.

1.0 INTRODUCTION

AMR presents challenges for global public health and is impacted by both human and animal antimicrobial usage. Ineffective antimicrobial agents endanger the effectiveness of many interventions in modern medicine. For instance, most treatment of common infections, prophylaxis for elective surgeries and transplantations, and cancer treatment are not possible with AMR. Widespread AMR, left unattended, compromises the achievement of multiple Sustainable Development Goals (SDGs), including ending poverty, ending hunger, ensuring healthy lives, reducing inequality, and revitalizing global development partnerships.

Economic growth is less likely to be achieved in sick populations, which in turn hinders poverty reduction efforts. And yet, poor people are more at risk of suffering from resistant infections and they are less able to prevent or treat them. In other words, AMR breeds poverty and poverty fuels AMR.

In the animal sector, AMR presents a grave danger to sustaining food production and the livelihood of farmers. Antimicrobial usage in animals threatens food safety and security and puts humans at greater risk of infection.

Global and national action plans have been developed and prioritized for implementation to mitigate the adverse effects of AMR. At the agricultural practice level, farmers and frontline veterinary practitioners must embrace evidence-based strategies and actions to meet this challenge. Farmers must seek to minimize the occurrence of infection through AMR control mechanisms, including proper feeding, avoiding stress to the animals, improved sanitation and hygiene, and early disease detection, isolation, and treatment of sick animals. For all animal sickness, treatment should be based on the best available clinical judgement supported by veterinary expertise and/or laboratory investigation. Judicious use of antimicrobial agents cannot be over-emphasized. The guidelines propose concrete evidence-based steps and actions to aid farmers and frontline veterinary practitioners in achieving these aspirations.

These guidelines for infection prevention and appropriate antimicrobial use in the animal sector have been developed in line with the *Uganda AMR National Action Plan 2018-2023*. By following this plan, farmers and veterinary practitioners will contribute to reduction of infections in animals, resulting in more judicious use of antimicrobial agents in the animal sector. This will reduce the development and spread of resistant microbes in animals and humans and reduce the presence of antimicrobial residues in food-producing animals.

These guidelines are for use in cattle farming in Uganda. Cattle are a key source of animal protein in the form of beef, milk, and ghee. Cattle and their products are also a source of income for a substantial number of small scale and large-scale cattle and dairy farmers.

They are presented under the following themes:

- Infection prevention practices
- Appropriate medicine use practices
- Keeping animal and veterinary medical product records on the farm.

2.0 INFECTION PREVENTION PRACTICES

East Coast fever and other tick-borne diseases, helminthiasis, mastitis, brucellosis, rabies, and various parasites are some of the commonly diagnosed cattle diseases in Uganda.³

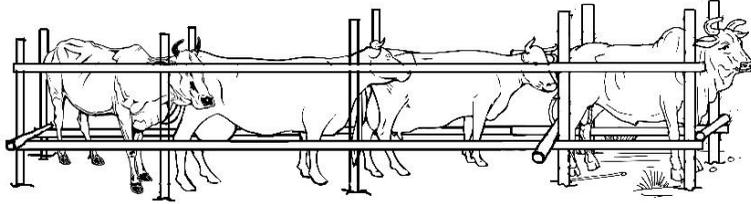
Prevention of infection is very important for promotion of health and wellbeing of cattle. Healthy cattle are a prerequisite for efficient and sustainable food production,⁴ subsequently preventing losses for the farmer. Moreover, prevention of infection and disease also leads to

³ Byaruhanga, J. et al. Retrospective study on cattle and poultry diseases in Uganda. *International Journal of Veterinary Science and Medicine*. 2017 [cited 2020 June 27]. Available from: <http://dx.doi.org/10.1016/j.ijvsm.2017.07.001>

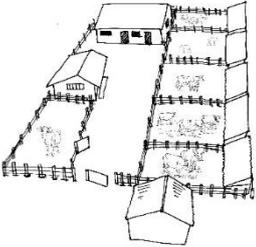
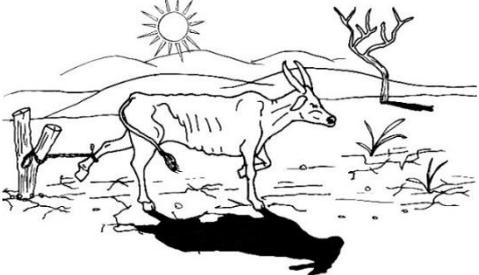
⁴ Animal Health Europe. Preventing disease. [Cited 2020 June 27] Available from: <https://www.animalhealthurope.eu/our-contribution/67-prevention-protects.html>

reduced use of antimicrobials, which in turn reduces the rate of development of antimicrobial resistance (AMR).

The burden of disease can be reduced through implementation of stringent infection prevention programmes involving biosecurity practices, routine isolation and quarantine of new animals, routine surveillance and action when necessary, and vaccination.



2.1 FOUR GUIDING PRINCIPLES OF INFECTION CONTROL IN CATTLE FARMING⁵

<p>Rule 1: Review biosecurity of new cattle introduced into a herd.</p>	<ul style="list-style-type: none">• Disease spreads around and between farms by contact with other cattle.• REMEMBER: Contact can occur INDIRECTLY by a needle, surgical instrument, manure, or people.• Secure your farm with a fence, isolate and quarantine new animals brought to the farm, and disinfect farm equipment routinely.	
<p>Rule 2: Stress is a killer. Avoid or minimize the levels of stress the cattle are exposed to.</p>	<ul style="list-style-type: none">• Stressed animals are far more likely to become diseased. This includes not only obvious physical stress factors, such as overcrowding or management procedures, but also exposure to microorganisms, which can cause major stress to the immune system.• THINK: If a procedure (e.g., castration or introduction of heifers to the dairy herd) causes the cattle to become stressed, ask “Can this be done in a less stressful manner?”	

⁵RUMA 2015. Responsible use of antimicrobials in dairy beef cattle production. <https://www.ruma.org.uk/cattle/responsible-use-antimicrobials-dairy-beef-cattle-production/>

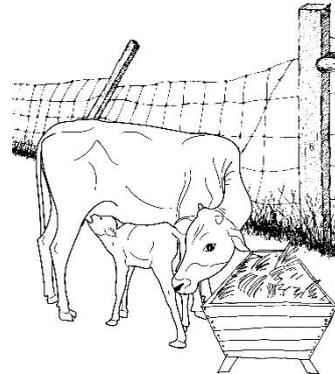
Rule 3:
Good
management
and hygiene

- There is no substitute for good management, hygiene and biosecurity measures.
- Cleaning buildings and equipment, paired with good hygiene, will make a difference.
- Don't spread disease by poor management and hygiene.



Rule 4:
Good
nutrition

- Sufficient intake of colostrum provides essential antibodies to protect calves as their immune system is developing.
- Balanced diets with adequate levels of trace elements, vitamins, and antioxidants are essential if the immune system of cattle is to work properly in tackling disease.



2.2 BIOSECURITY PRACTICES

It is important to observe the following biosecurity practices.

2.2.1 ACQUISITION OF NEW CATTLE

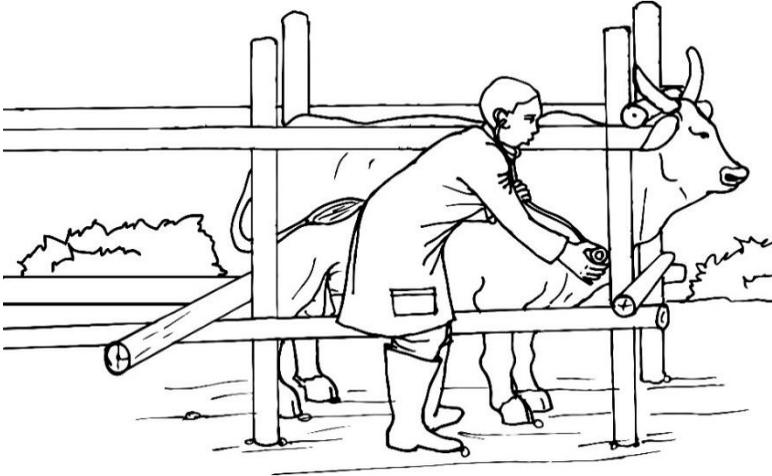


Illustration: Veterinary practitioner examining an animal.

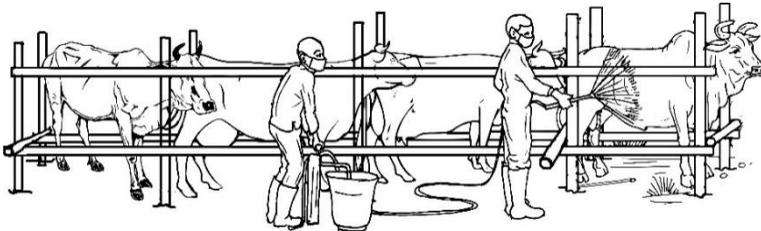


Illustration: Veterinary practitioner spraying the newly acquired cow.

- Isolate new cattle for at least **one month**⁶ into a building or paddock to prevent contact with other cattle.
- Watch out for signs of infection in isolated animals during this period.
- If the animals are diseased, call a veterinary practitioner to advise about their treatment to ensure that they are cured before moving them to the herd.
- If the cattle are free of infection, seek veterinary advice about their vaccination before moving them to the herd.
- Follow guidelines for the acquisition of new animals (above) when animals are introduced or returned to your farm.

Seek advice from a veterinary practitioner before buying the animal to ensure that animals are treated and vaccinated before moving to the herd.

Risk assessment protocols to consider for incoming stock during the isolation period and the disease risks in the particular locations of purchase.

- Consult a veterinary practitioner to check health status of animals before purchase.
- Consult a veterinary practitioner about specific disease risks in particular locations of purchase.
- Check and observe animal(s) for signs of disease on arrival and for the entire isolation period.
- Assess risk of parasites such as lungworm, fluke, lice etc.; treat accordingly at beginning of isolation period.
- Administer preventive treatments such as deworming medicines during isolation.

⁶ The Department of Agriculture, Fisheries & Food. Buying in cattle.
<https://www.agriculture.gov.ie/media/migration/animalhealthwelfare/veterinary/virology/informationaboutdiseases/animalhealth/herdhealth/Buying-HHBuy1-final.pdf>

- Give vaccines to incoming animals to protect them from diseases already on your farm during isolation.

2.2.2 DELIVERY OR COLLECTION OF ANIMALS

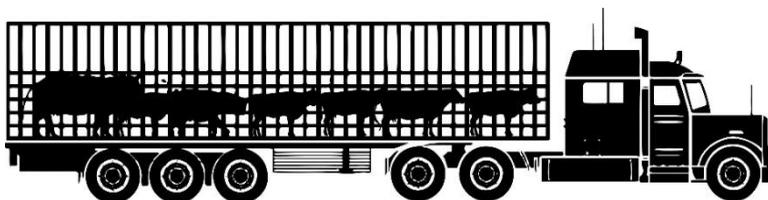


Illustration: Vehicle with open roof and rails to restrain the cattle.

- Isolate the delivery and pick up points from other cattle on the farm.
- Ensure that vehicles stay outside of the farm area to avoid introduction of contamination into the farm; otherwise ensure that vehicle tyres are disinfected by driving through disinfectant in a tyre bath.
- Ensure that the driver stays in his/her car and does not assist in moving cattle from pens unless he/she is in farm-dedicated protective clothing and footwear.

2.2.3 MOVEMENT OF CATTLE OFF THE FARM-BULL HIRE, SALES

- Examine bulls prior to hiring them. In case you are not sure of what to check for, engage a veterinary practitioner.
- Follow guidelines for acquisition of new animals (above) when animals are introduced or returned to your farm.

2.2.4 DISPOSAL OF DEAD CATTLE

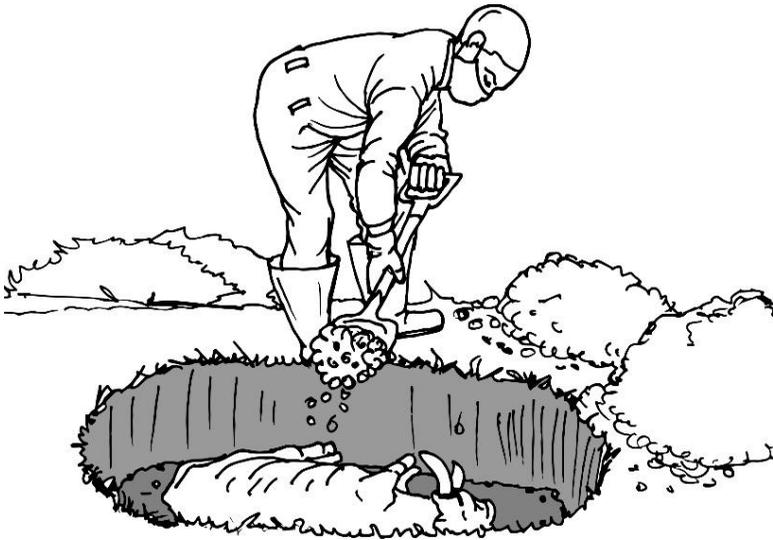


Illustration: Farmer disposing of deceased cow in a deep pit.

- It is important that dead animals are disposed of as soon as possible to avoid spread of infections.
- Incinerate or bury dead animals in a deep pit, at least 4 ft from the surface to the carcass, as soon as is practical.
- Seek advice from a veterinary practitioner if animals die suddenly and unexpectedly since death could be due to anthrax or another dangerous cause that requires urgent public health intervention.

2.2.5 COLOSTRUM

- Do not give colostrum from cows not in your herd to calves in your herd because you cannot be sure that it is free from infection.

2.2.6 QUALITY OF WATER FOR USE ON FARM

- Ensure that drinking water for the cattle is clean.
- Use water sources whose quality of water you can trust.

2.2.7 PEST AND VERMIN CONTROL

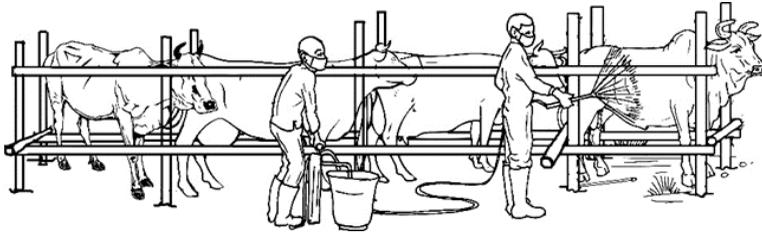


Illustration: Cattle being sprayed.

Pests include rats, mice, flies etc. Vermin and stray animals include birds, cats, and dogs. These can spread disease.

- Cover entrance points to areas for mixing and storage of feed with a screen. Use wire mesh screening to prevent entry of rats and mice.
- The animal house can also be sealed to prevent entry of pests and rodents.
- Remove rubbish that can provide potential breeding sites for vermin.
- To reduce nuisance fly density on the farm, use fly traps or screens.
- Ensure that domesticated pets, and other animals and birds, do not have access to feed and bedding stores to avoid direct or indirect spread of disease.
- Contract a professional to eliminate pests and rodents.

2.3 GOOD PERSONAL HYGIENE PRACTICES



Illustration: Farmer donning personal protective equipment and performing hand hygiene practices in preparation for attending to his animals.

- Ensure that footwear of visiting personnel is disinfected with chlorine-treated footbath before accessing the farm.
- All persons who handle the cattle should first disinfect their hands with alcohol/chlorhexidine solution or wash their hands with water and soap before any contact with the animals.
- Ensure that farm staff have separate clothing and footwear for use on the farm.
- Ensure that boots and clothes of farm workers are clean and free of faecal matter, dust, dirt, and blood.
- Ensure that staff have a toilet/pit latrine with an area for hand washing (including soap).

2.4 FEED AND BEDDING

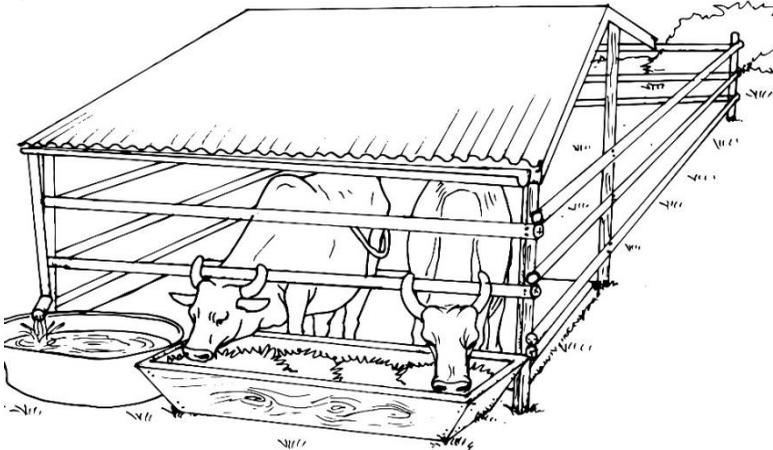


Illustration: Pens must be clean and well maintained.

- Only buy feed from trustworthy sources.
- Calf pen must be maintained clean and straw-bedding provided to ensure comfort.
- When buying feed and bedding for cattle, ensure that they do not have visible signs of contamination such as manure.
- Check feed to ensure that it isn't spoilt or moldy before giving it to cattle.
- Ensure that feed and bedding stores are in good condition so that pests, wildlife, dogs, and cats cannot access them.
- Clean and disinfect feed bins on a regular basis.

2.5 CLEANING AND DISINFECTION OF THE SLEEPING HOUSES

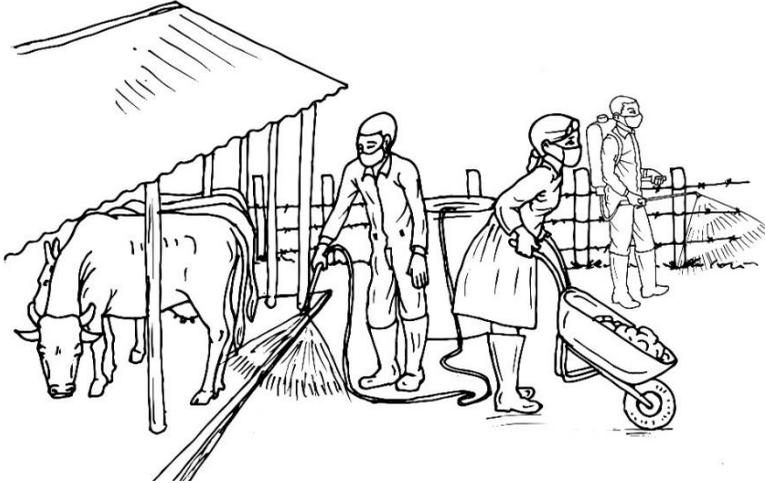


Illustration: A farmer and other farm workers cleaning the cow shed.

- Clean the floor area with water (detergent can be added) to remove visible dirt before disinfection.
- Clean walls above cattle level and ceilings or roofs.
- Before using a disinfectant, ensure that the area is dry, if possible.
- Mix disinfectants according to the manufacturer's instruction.
- Do not use a pressure washer to apply disinfectants.
- Allow the place cleaned to dry before bringing back the animals.

2.6 AVOID CO-GRAZING WITH NEIGHBORS

- Sharing of pasture and water with neighbors can be a cause of disease and present vector challenges on a farm.

- Always prevent neighbors from grazing on your farm since this can lead to acquiring multi-acaricide-resistant ticks that are difficult to eradicate.
- Avoid sharing your source of water with neighbors since shared water points can be a source of infection for diseases.

2.7 SOURCING OF SEMEN

- Obtain semen from reliable sources.
- Always request the record for the sire.
- Keep records of all semen used on the farm.
- Should there be any breeding challenge suspected to emanate from the semen, notify your veterinary practitioner or artificial insemination technician for appropriate action.

2.8 VACCINATION⁷

- Talk to your farm's veterinary practitioner to develop a specific vaccination program for your farm.
- Once a vaccination program has been established, ensure that all the vaccines are given as scheduled.
- Develop a plan for routine monitoring of effectiveness of the vaccination program by a suitable laboratory.
- Take note that vaccination raises an animal's resistance to disease; however, in the absence of good management practices, the animal can still get sick.

⁷ RUMA. Responsible use of antimicrobials in cattle production. 2015 [cited 2020 June 27]. Available from: <https://www.ruma.org.uk/cattle/responsible-use-antimicrobials-dairy-beef-cattle-production/>

2.9 PARASITE CONTROL

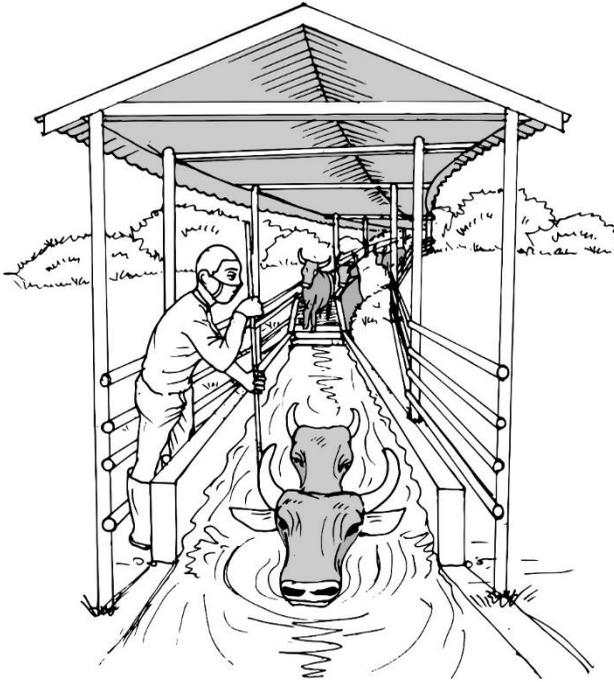


Illustration: Cattle passing through a spray race.

- Manage environment through rotation of pasture.
- Treat cattle at risk of parasitic infection on a seasonal basis.
- Monitor the performance of dewormers with support from your area veterinary practitioner and laboratory. Note that cattle will develop resistance against parasitic gastroenteritis with regular deworming using the same type of drugs.
- Discuss quarantine for animals with your veterinary practitioner.

- Use acaricides strategically to control ticks on your farm. Always consult with your veterinary practitioner for the appropriate acaricide to use against ticks on your farm.
- Use tsetse fly traps or appropriate insecticide to reduce the population of tsetse flies, which will in turn reduce the burden of nagana on your farm.

2.10 FOOT CARE FOR CATTLE⁸

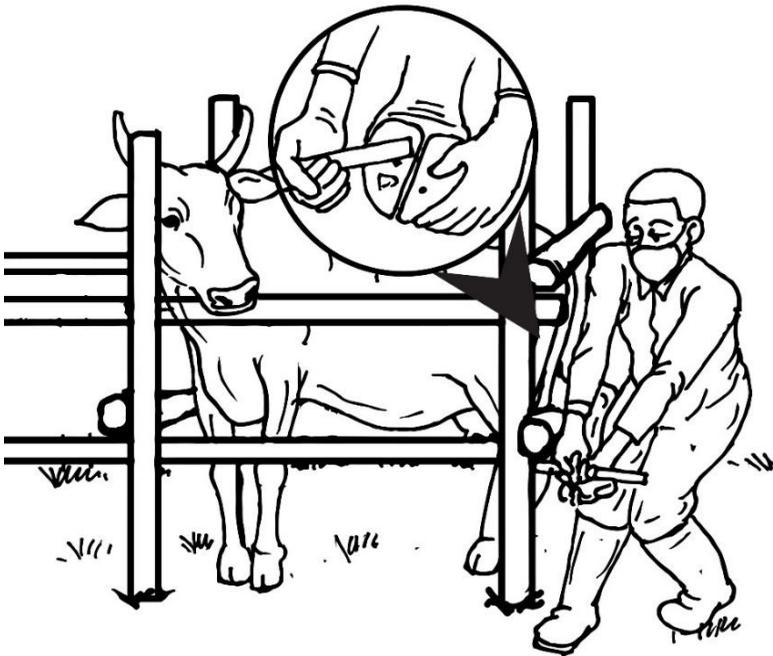


Illustration: A farmer cleaning feet of cattle.

⁸ Ishler, VA., Wolfgang, D, and Griswold, D. Prevention and control of foot problems in dairy cows. 2016 Feb [cited 2020 June 27]. Available from: <https://extension.psu.edu/prevention-and-control-of-foot-problems-in-dairy-cows>

- Clean and disinfect feet of cattle every week or every two weeks. If there is an outbreak of foot infection, clean and disinfect three times per week. Note that clean environment prevents foot-rot.
- Inspect hooves and legs of cattle to identify any problems early.
- Clean feet with water before medicated bath.
- Change foot bath solution after every 150 to 200 cows.
- Provide exercise space and opportunities for zero-grazed animals.
- Always contact your veterinary practitioner for management of any foot condition.

2.1 | PREVENTION OF ENTERITIS AND PNEUMONIA

- Clean feces from housing areas at least once daily to reduce risk of diseases such as coccidiosis in calves.
- Ensure that housing facilities are well ventilated.
- Provide on average 3 sq m per animal to avoid overcrowding in the housing facilities.

2.12 DRY COW MANAGEMENT⁹

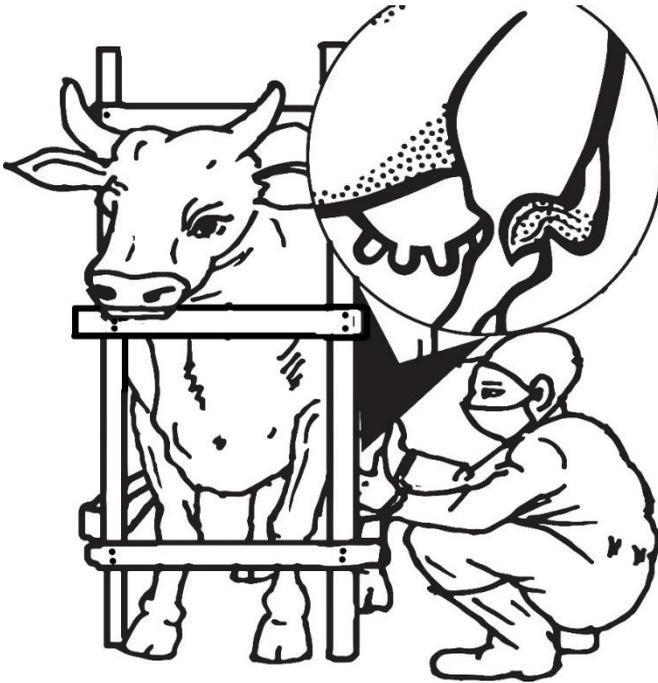


Illustration: Inspection of mammary glands.

The dry cow period is a high-risk period for the development of new bacterial infections. It is therefore important to implement dry cow therapy to ensure the health and welfare of cows.

The two major risk periods for acquiring infections are:

1. At the start of the dry period, when the udder shrinks and is more susceptible to infections.

⁹ RUMA 2015. Responsible use of antimicrobials in dry cow strategies.
<https://www.ruma.org.uk/cattle/responsible-use-of-antimicrobials-in-dry-cow-management/>

2. At the end of the dry period just before calving.

The dairy farmer should:

- On a regular basis develop, implement and review a dry cow strategy for your cows with your vet.
- Submit milk samples to laboratory to identify microorganisms in the udder and their sensitivity to various antibiotics.
- Maintain a record of all mastitis cases and treatments.
- Monitor each cow being dried off for infections and treat accordingly.
- Maintain an accurate record of the treated cows and the medicines used to treat them.
- Antimicrobials should only be used on recommendation of a veterinary surgeon.
- Ensure that prescribed antimicrobials¹⁰ are only given to the animal for which they were prescribed.
- Be in constant consultation with a veterinarian for the treatment of sick animals.
- Obtain medicines from licensed outlets (pharmacies or drug shops) on presentation of a valid prescription from a veterinary surgeon.
- Only use legally obtained antimicrobials. The quality of illegally obtained antimicrobials cannot be confirmed.
- Comply with the appropriate withdrawal period before the slaughter of treated animals or inclusion of milk from treated cows to the milk from other cows.

¹⁰ The word “antimicrobial” has been used to represent antimicrobials as well.

2.13 PREVENTION OF MASTITIS

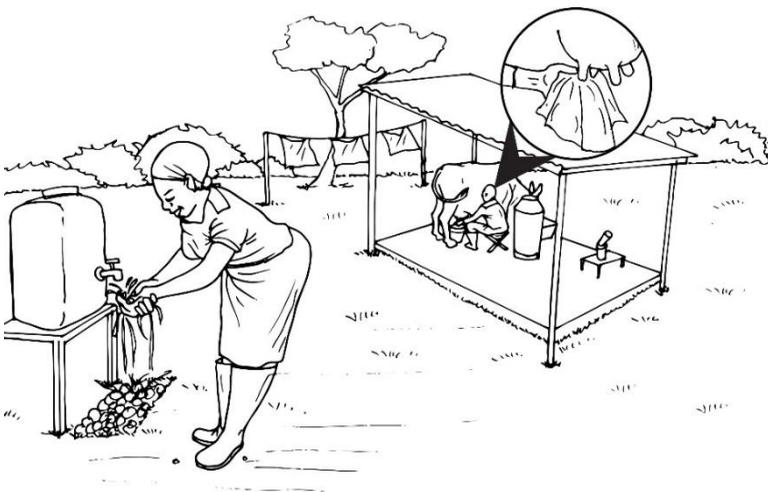


Illustration: Wash hands and use udder towels.

- Wash milking cans and buckets on a daily basis, paying attention to corners of the cans.
- Dry the milking can and buckets in the sun.
- If you have a milking machine, clean it after every use, and in accordance with manufacturer's instruction.
- Ensure that the milking machine is tested and maintained at least once a year by an approved engineer.
- Wash hands with soap and clean water before milking cows.
- Wash the udder and teat with clean water and wipe with clean udder towel. Each cow should have its own udder towel.
- Disinfect the teat with iodine-based antiseptics, chlorhexidine, or other approved disinfectants at milking to reduce bacteria on the teat end and prevent infection during milking.

- Ensure that the bedded areas for lactating cows, heifers, and dry cows is clean.
- Rotate and maintain pastures.
- Monitor to detect and treat any cases of mastitis promptly.
- If cow(s) have persistent mastitis, consider culling them.

2.14 SLURRY DISPOSAL AND WASTE MANAGEMENT

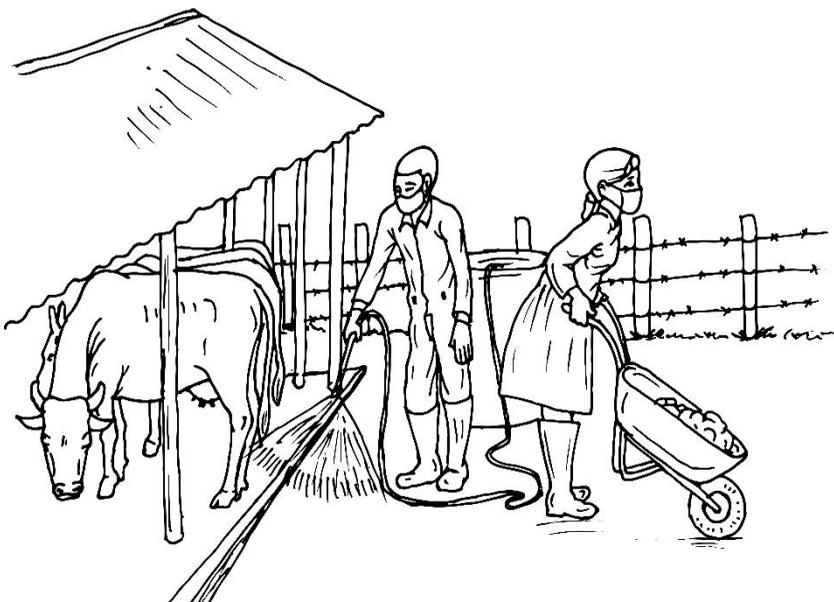


Illustration: Removing slurry from a cattle house

- Remove bedding, manure and other waste materials from buildings on a regular basis.
- Dig pits large enough to store manure/slurry for at least four months.
- Store slurry for at least four weeks before disposal to kill most microorganisms that can cause disease.
- Use dedicated vehicles for removal of slurry.

- Store manure in a fenced paddock, stack and compost before spreading on land for growing food.
- If manure is spread on pasture, ensure that cattle do not feed on the pasture for at least 60 days.

2.15 PREVENTION OF INJURIES

- Ensure that the farm is safe for cattle, i.e. has no sharp corners, smooth concrete, or improper size of openings.
- Walk through the farm often and note the condition of fences, pens and floor. Make necessary repairs promptly.
- Ensure that standing and lying spaces are safe.

2.16 MANAGEMENT OF NEWBORN CALVES

- Ensure that calves receive good quality colostrum in the first hour of birth. They should receive a minimum of 4 liters of colostrum within the first six hours of birth.
- Ensure that calves are fed a minimum of two times a day in the first 28 days of their lives.
- Ensure that calves have easy access to clean water at all times.

2.17 FARM EQUIPMENT



Illustration: A farmer cleaning farm equipment.

- Clean and disinfect equipment (including boots, vehicles), machinery and handling facilities that are shared between cattle and other livestock, before use between herds.

3.0 APPROPRIATE ANTIMICROBIAL USE PRACTICES

3.1 PURPOSE OF THE GUIDELINES

These antimicrobial use guidelines work in two main ways: first, they help create farm conditions that prevent or minimize the occurrence and spread of infections; second, they promote the effective and safe use of these drugs. Taken together, these two approaches broadly would minimize the selection of antimicrobial resistant bacteria in animals.

The underlying purpose is to conserve and sustain the effectiveness of available antimicrobial agents intended for use in animals so as to:

- Enable farmers to comply with the moral obligation and economical need to keep animals healthy.
- Protect consumer health by ensuring the safety of food of animal origin.
- Prevent or reduce the transfer of resistant microbes within animal populations, so as to maintain the efficacy of antimicrobial agents used in livestock.
- Prevent or reduce the transfer of resistant microbes or their resistance genes from animals to humans to maintain the efficacy of antimicrobial agents used in human medicine.
- Prevent the contamination of animal-derived food with antimicrobial residues that may have a detrimental effect on human health.

3.2 GENERAL PRINCIPLES TO GUIDE DECISIONS ON THE USE OF ANTIMICROBIAL AGENTS IN ANIMALS

- Use of antimicrobial agents in veterinary medicine is guided by the law which outlines licensed persons who can trade in, prescribe, and/or administer these medicines. Only a qualified veterinary practitioner is authorized to prescribe their use.
- Antimicrobial agents used for therapy should be used for as long as needed, but for as short a duration as possible and using the appropriate dosage regimen.
- Label instructions as provided by the manufacturer should be carefully followed. Due attention must be paid to species and disease indications and contraindications, dosage regimens, and storage instructions. Extra-label use of the antimicrobial agent should be exceptional, and always under the professional responsibility of a veterinary practitioner.

- Records of all veterinary medicinal products administered to animals and those available on the farm should be kept in a retrievable form. Additionally, there should be an effective system of stock control.
- Use of vaccines and strict adherence to the proposed infection prevention measures are effective and have been proven as better alternatives to reduce or eliminate antimicrobial use in the animal sector.
- Antimicrobial agents should be used under supervision of a veterinary practitioner.
 - Therapeutic antimicrobials should be used when it is known or suspected that an infectious agent is present which will be susceptible to therapy.
 - It is the responsibility of the veterinary practitioner to choose the antimicrobial product based on his/her informed professional judgement, balancing the risks and benefits for humans and animals.
 - Antimicrobial agents should only be used when necessary and then selected rationally and used appropriately.
 - When antimicrobials need to be used for therapy, bacteriological diagnosis with sensitivity testing should, whenever possible, be part of the informed professional judgement.

3.3 CONSULTATION WITH HEALTH PROFESSIONALS TO PROMOTE APPROPRIATE ANTIMICROBIAL USE

Only professionals trained to the level of a veterinary surgeon or higher have the requisite knowledge, expertise and experience to prescribe antimicrobial medicines.

Each case provides a different set of considerations as explained below.

1. Drug factors such as dosage, dose, dosage interval, route of administration, duration of treatment, mechanism of action, combined use, adverse drug reactions.
2. Microbial infection factors, including objective evidence of infection, susceptibility of the causative organism(s), stage of infection, locality of infection, and microenvironment at the site of infection.
3. Animal factors such as type, age, condition, and sex of animal, disease condition, type of husbandry, and feeding of animals.
4. Animal farmer factors, such as agreement between farmer and veterinary practitioner on treatment policy, level of training, and experience of farmer.

3.4 KEY POINTS FOR FARMERS FOR DIAGNOSIS OF COMMON CONDITIONS

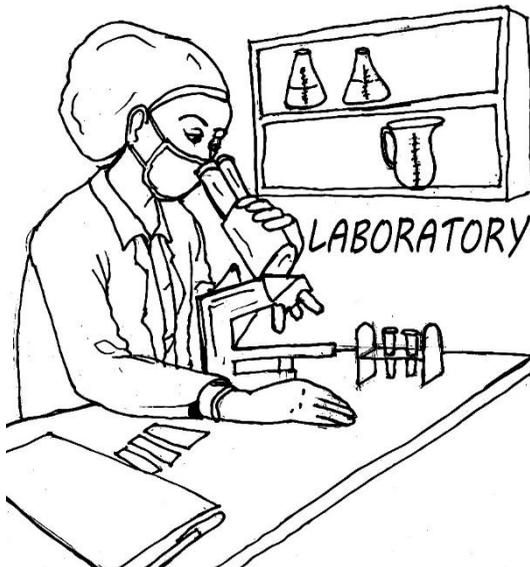


Illustration: A laboratory technician examining a laboratory sample under a microscope.

In all animal species, “prevention is better than cure”.¹¹ However, sometimes animals become sick regardless of good prevention strategies and proper care. When this happens, early recognition and treatment is essential to protect animal welfare and promote responsible use of medicines.

- Isolate sick cattle so as to slow the spread of disease to healthy cattle and allow increased care for sick cattle.
- Cattle with different diseases should be kept in different groups.
- Protect isolation pens/paddocks from extreme weather to aid in animal recovery.
- Check the signs that the animal is displaying that are different from the normal to identify the disease.
- Consult a veterinary practitioner to accurately diagnose the disease.
- Give accurate information to the veterinary practitioner to aid in making a correct diagnosis.
- In case the veterinary practitioner wants to take samples from the animals, allow him/her to do so to make an accurate diagnosis.

3.5 APPROPRIATE APPROACH TO TREATMENT

If cattle are found to be sick, they should be treated promptly. The following should be kept in mind:

- Ensure that the right medicine for the diagnosed condition is selected or prescribed by the veterinary practitioner.
- Inform the prescriber about other medicines being administered to the animals so that adverse reactions can be avoided.
- Read labels of medicines to be used and follow the label instructions.
- Keep information on all medicines used on file and readily available to stock-keepers.

¹¹ Federation of Veterinarians of Europe. Antimicrobial use in food-producing animals. 2016 February 29 [cited on 2020 June 27]. Available from https://www.ema.europa.eu/en/documents/report/annex-replies-efsa/ema-questions-use-antimicrobials-food-producing-animals-eu-possible-measures-reduce-antimicrobial_en.pdf

- Seek professional advice if you are in doubt.
- Do not give medicines for injection, medicines for infusion into the udder, or medicines added to feed or water unless they are absolutely necessary and have been prescribed by the veterinary practitioner.
- ONLY use prescribed medicines to treat the specific animals for which they were prescribed.
- Ensure that the end of medication for in-feed or in-water is clearly defined by cleaning all equipment used thoroughly including pipes, bins, header tank etc.
- Make and keep a record of the animal treated, product used, dose, duration of treatment, and withdrawal period.

3.5.1 OBTAINING VETERINARY MEDICINES



Illustration: A farmer receiving instructions on use of medicines from a trained veterinary practitioner.

- DO NOT use illegally obtained medicines on the farm since their safety and efficacy cannot be ascertained.
- Do not borrow or move medicines between farms.
- Check expiry date and ensure that medicines and other products are not expired before buying them for use on the farm.

3.5.2 ADMINISTRATION OF VETERINARY MEDICINES

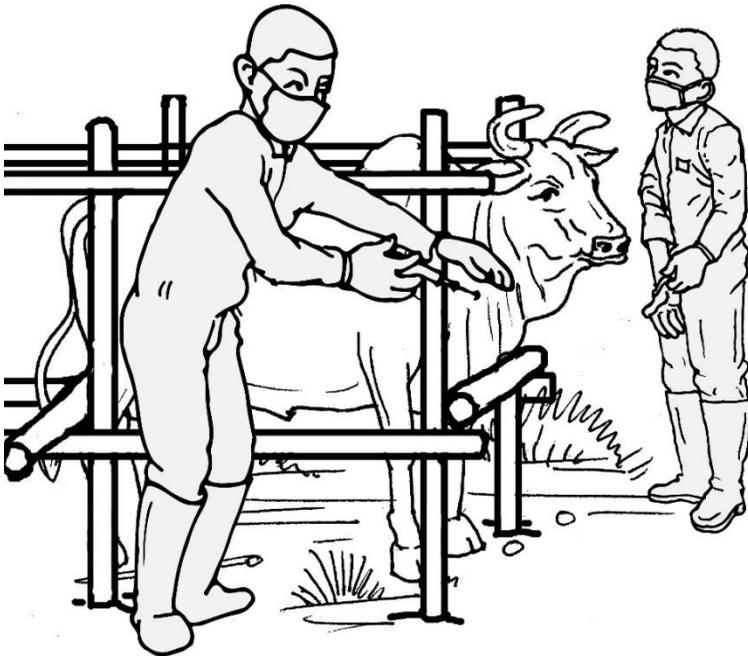


Illustration: A farmer administering medicine to a cow on the farm.

- Obtain clear instructions regarding diagnosis, and the prescription from the veterinary practitioner.
- Do not use medicines without instructions.

- Give animals the full course of treatment at the correct dosage for the defined period.
- Do not give two or more antimicrobials at the same time unless your veterinary practitioner has advised you to do so.

3.5.3 STORAGE OF VETERINARY MEDICINES

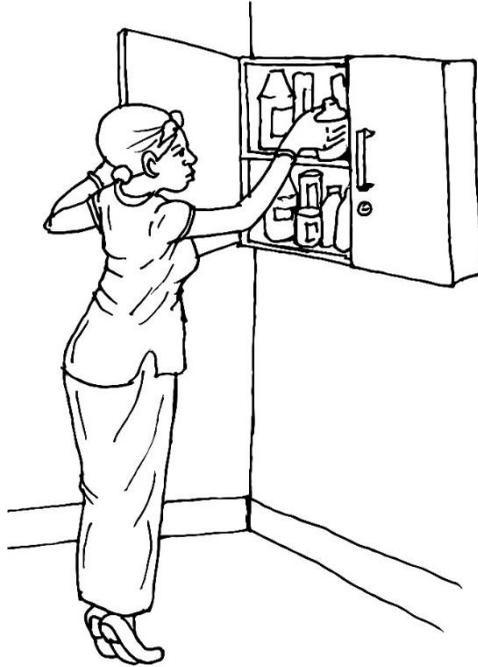


Illustration: A farmer picking medicine from the storage cabin on the farm's medicine store.

- Store medicines as indicated on the medicine label.
- Store most medicines in a clean, cool, dry area such as a farm office or utility room.
- Store medicines away from direct sunlight, dust, animals and insects.

- Store medicines that should be refrigerated at temperatures between 2 °C and 8 °C.
- Keep medicines locked away from the reach of children and unauthorized persons.

3.5.4 DISPOSAL OF UNUSED OR EXPIRED MEDICINES

- RETURN unused medicines to the prescribing veterinary practitioner or supplier for disposal.
- Dispose of unused, out-of-date medicines, containers and application equipment (including needles to a sharps container) when the treatment for which they were intended is completed.
- Follow manufacturer's advice as written on medicine label.
- Do not reuse medicine containers; wash them and dispose of them in a pit.

3.6 WITHDRAWAL PERIOD

A withdrawal period is the minimum time required between the last treatment and the collection of meat or milk for human consumption.

The withdrawal period ensures that the food produced from treated animals does not contain harmful residues.

- Identify treated cattle to ensure that withdrawal times are observed.
- Observe the minimum withdrawal period for milk as instructed by the drug manufacturer.
- Observe a minimum withdrawal period for meat as instructed by the manufacturer.
- Follow the veterinary practitioner's advice in case he/she increases the withdrawal period for certain medicines.

3.7 VETERINARY EQUIPMENT

- Make sure all re-usable syringes and needles used are cleaned immediately after use and stored in a clean box.
- Do not share instruments and hypodermic needles between cattle from the same herd, except after cleaning and disinfecting between animals.
- Do not share surgical instruments and hypodermic needles between herds.

4.0 KEEPING RECORDS FOR ANIMALS AND VETERINARY MEDICINAL PRODUCTS



Illustration: A farmer reviewing farm records.

- Keep a record of medicine use on the farm. You can use a durable book, files, or an electronic system.
- If you use an electronic system, ensure that the information is regularly backed up in a retrievable form (e.g., on an external hard drive).

4.1 HERD HEALTH REGISTER

- This contains information such as:
 - Identity of diseased animal(s)
 - History of disease
 - Symptoms of disease
 - Diagnosis
 - Treatment given
 - Name of veterinary practitioner who treated animals

Example of cattle farm register

Health Record	
Animal species	Date
Animal Name	Identity/No/Tag
Breed	Age
Case history	
Clinical exam	
Laboratory test	
Diagnosis	
Prescription	
Withdrawal period for each medicine	
Veterinary practitioner	
Name	Contact
Signature	Date

4.2 RECORDS FOR VETERINARY MEDICINES USED ON THE CATTLE FARM

- Upon purchase of a medicine, record:
 - Name of the prescribing veterinary surgeon
 - Name of veterinary medicine
 - Batch number
 - Date of expiry
 - Date of purchase
 - Quantity obtained
 - Name and address of the supplier
- At the time of administration, record:
 - Name of veterinary medicine
 - Name and identity of the animal
 - Date of administration
 - Quantity administered
 - Withdrawal period
 - Identity of the animal(s) treated
- In case you dispose of the medicine without using it, record:
 - Date of disposal
 - Quantity of product
 - How veterinary medicinal product was disposed of
 - Where product was disposed of
- Ensure that all records are kept for at least five years.

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