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ROYAL GOVERNMENT OF BHUTAN
Ministry of Agriculture and Forests
Department of Livestock

DOL

Antibiotic Guidelines for Livestock in Bhutan

Towards preserving the efficacy of antibiotics

NATIONAL CENTRE FOR ANIMAL HEALTH
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FOREWORD

Antibiotics are a special class of medicines used widely in both human and animal medicine for over past 80 years. They are also known to contribute towards meeting the increasing demand for safe food of animal origin. However, its indiscriminate use in veterinary practice and uncontrolled use as growth promoters in animal feeds has led to emergence of resistant bacteria known as antimicrobial resistance (AMR

Resistant bacteria especially the zoonotic arising either in humans, animals or the environment may spread from one species to the other. Therefore, in the current era, an important agenda on the human-animal-environment concern is the emergence of AMR at the global, regional and national level. Such AMR issues can have far reaching consequences since this threatens effective treatment of human and animals coupled with other emerging issues. While the World Animal Health Organization (OIE), World Health Organization (WHO) and Food and Agriculture Organization (FAO) are working hand in hand to address such concerns through the tri-partite approach at a global and regional level, we in Bhutan are also pursuing the same agenda at the national level.

Hence, in order to safeguard the public health and ensure sustainability of livestock production, the efficacy of antibiotics needs to be preserved through their rational use. Thus, the National Centre for Animal Health (NCAH) has developed *Antibiotic Guidelines for Livestock in Bhutan* in order to promote its judicious use for animal health and production. The guideline is being developed adopting the principles of evidence-based medicine involving the relevant expertise from both within and outside the agency. Further, this guideline can be used in conjunction with National Veterinary Drug Formulary (NVDF) and Standard Treatment Guidelines for Animals (STGA) developed by NCAH & National Animal Hospital (NAH), DoL.

We are confident that this guideline will serve as a useful resource in providing the required information for prescribing antimicrobials by the veterinarians, veterinary para-professionals and other animal health workers in their routine animal health activities.

I would like to congratulate the core members, technical advisors and in particular Dr. Kinzang Dukpa, Program Director, NCAH and Dr. N. K. Thapa, AMR Focal Point, for livestock for the excellent coordination in production of this booklet.

Dr. Tashi Samdup
Director General

Acknowledgement

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Contents

Glossary

ABST: Antibiotic sensitivity test
BW: Body weight
BAFRA: Bhutan Agriculture & Food regulatory Authority
CNS: Central nervous system
CST: Culture & Sensitivity Test
DRA: Drug Regulatory Authority
EVDL: Essential Veterinary Drug List
GI: Gastrointestinal
Hrs: Hours
IM: Intramuscular
IV: Intravenous
LA: Long acting
NSAID: Non-steroidal anti-inflammatory drug
PO: Orally *(per os)*
SA: Short acting
SC: Subcutaneous
WP: withdrawal period

1. Introduction

Antibiotics, also called antibacterials, are a type of antimicrobial medicines used in the treatment and prevention of bacterial infections.

Antibiotics can be individually administered to animals to treat (therapy) or prevent (prophylaxis) disease.

Antibacterial can also be administered to clinically healthy animals belonging to the same flock or pen as animals with clinical signs (metaphylaxis) and is typically used during disease outbreaks in aquaculture and in poultry and also in other animals like swine and cattle. Infections are treated before their clinical appearance and the treatment period is usually shorter than for therapeutic treatment.

Systemic antimicrobial treatment can be administered orally, through medicated feed or water, or by injections - usually as an initiation of antimicrobial treatment typically followed by systemic or local treatment.

Local antimicrobial treatment includes intramammary infusion for mastitis treatment, intrauterine treatment and topical skin, ear and eye treatment.

With regard to farmed fish, antimicrobial treatment is almost always administered by medicated feed, although some brood stock may be treated individually by injection or immersion in water.

Antimicrobial treatment is usually administered on an individual basis to pets. Systemic treatment is conducted orally, by the administration of tablets or mixtures, or by injections. Local antimicrobial treatment includes topical skin, ear and eye treatment.

2. Antibiotics in food-producing animals

Antibiotics are widely used in food-producing animals and this has contributed to the emergence of antibiotic-resistant bacteria in food-producing animals. These resistant bacteria can contaminate the foods that come from those animals, and persons who consume these foods can develop antibiotic-resistant infections.

There is strong evidence that antibiotic use in food-producing animals can have negative impact on public health through the following sequence of events:

- Use of antibiotics in food-producing animals allows antibiotic-resistant bacteria to thrive while susceptible bacteria are suppressed or die;
- Resistant bacteria can be transmitted from food-producing animals to humans through the food supply;
- Resistant bacteria can cause infections in humans; and
- Infections caused by resistant bacteria can result in adverse human health consequences.

Because of the link between antibiotic use in food-producing animals and the occurrence of antibiotic-resistant infections in humans, it is encouraged to put the following basic principles to minimize inappropriate use of antibiotics in humans and animals:

1. *Herd management and size:* Small closed breeding finisher herds, which are family owned, usually do well when compared with farms where employees look after animals;
2. *Mixing of animals from different sources should be avoided:* Introduction of three-site system consisting of the breeder sites, the nursery sites and finishing sites in separate houses;
3. *Population density:* Increased density in pens or barn has been linked to increased stress and disease transmission resulting in higher mortality and reduced growth;
4. *Weaning age:* Early weaning below 45 days of age in Bhutan, sometimes below 10 days to eliminate disease without depopulation;
5. *Housing environment:* Appropriate housing and environmental management for disease prevention; and

6. *Herd/population immunity:* Protection via natural or induced immunity to control disease via vaccination.

3. Antibiotics as growth promoters in food-animals

Supplementing animal feed with antibiotics to enhance growth (growth promoter) has been common practice for more than 30 years and is estimated to constitute more than half the total antimicrobial use worldwide. These products improved feed conversion and animal growth and reduced morbidity and mortality due to clinical and subclinical diseases.

With accumulating evidence, the use of antimicrobial drugs and development of resistance in animals and humans has been found as interrelated. Therefore, antibiotics as growth promoters are no longer encouraged as a tool in animal production.

4. Rational use of Antibiotics

In order to minimize the possible impact of animal antibiotic usage on public and animal health, various international organizations such as the WHO, OIE, FAO and the EU Commission have in recent years emphasized the importance of prudent and rational antibiotic use in animals.

These organizations have emphasized to a greater extent that the prudent antibiotic use is important, not only to safeguard the efficacy of antimicrobial drugs in veterinary medicine but, even more so, to prevent the emergence and spread of undesirable resistance phenotypes in zoonotic pathogens as well as in commensal bacteria that can be transmitted between animals and humans.

Following guidelines should be followed for the responsible use of antimicrobials in animals

4.1 Efficient management

Antimicrobials are not a substitute for good management and hence, it should be aimed to reduce infection in farms and pet animals.

Encourage vaccination to prevent disease in the first place and involve hygiene and disinfection procedures, biosecurity measures, management improvements including stocking density etc.

4.2 Avoid inappropriate use

Antimicrobials should only be used when it is known or suspected that an infectious agent is present which are susceptible to such agent. Limit antimicrobial treatment to ill or at-risk animals. Successful treatment relies on the correct administration of antimicrobials. The competent user should follow the manufacturers' instructions or guideline on the route of administration, dose, dose frequency, duration of treatment, handling, storage, withdrawal periods and labelling. Above all, emphasis should also be in avoiding under dosing and also completing the course of treatment.

4.3 Choose the right antimicrobials

Wherever possible, antimicrobial usage should be based on exact (preferably microbial) diagnosis. Treatment may be started on the basis of a clinical diagnosis before microbial sensitivity results can be obtained. However, sensitivity of suspected causal organisms should, be determined so that if treatment fails it can be changed subsequent to results of susceptibility testing.

4.4 Monitor antimicrobial sensitivity

Clinical diagnosis is often the initial basis for treatment however, bacterial culture and sensitivity must be determined whenever possible to change to most sensitive antimicrobials.

4.5 Minimise use

The prophylactic use of antimicrobials is never a substitute for good management. Use antimicrobials only when animals are at risk and or when there is evidence that usage reduces morbidity and/or mortality in the animals.

4.6 Good Record keeping

Proper records of treatment and the outcome of treatment are also essential to evaluate the effectiveness of treatments. Historical information, including laboratory sensitivity data, is also valuable in deciding on future treatments.

Hence, a proper and accurate record of the antimicrobial usages should be maintained.

4.7 Report of treatment failure

Treatment failure may be the first indication of resistance to an antimicrobial. It is essential therefore that each and every suspected failure to be reported to the concerned focal persons/agency.

4.8 Restriction of use of Fluoroquinolones and third/fourth generation Cephalosporins

These two classes of antibiotics are considered to be critically important both for human and animal health and hence should be used as recommended below:

- Not to be used as preventive treatment applied by feed or water in the absence of clinical signs in the animals to be treated.
- Not to be used as a first line of treatment unless technically justified.

Extra label use of Fluoroquinolones and Cephalosporins should be limited and used only when no alternatives are available.

5. Specific antibacterials

5.1 Aminoglycosides

Aminoglycosides are amongst the most rapid bactericidal medicines available for treatment of aerobic gram-negative sepsis. They have demonstrated safety as empirical treatment in severe infection. Gentamicin is the aminoglycoside of choice where approximately 95% or more of aerobic gram-negative isolates are susceptible.

Aminoglycosides are administered IM or SC for systemic infections as they are not absorbed from the GI tract.

All aminoglycosides are potentially ototoxic and nephrotoxic. Clinically significant adverse effects are more likely with advancing age, pre-existing renal impairment or hearing loss.

Preparations available in EVDL: Gentamicin, Amikacin and Streptomycin.

5.2 Cephalosporins

Most cephalosporins are unstable in gastric acid and must be given IM or IV except for Cephalexin and cefadroxil, cefachlor, and cefixime. Cephalosporins are distributed in the extracellular fluid and penetrate body tissues except the cerebrospinal fluid (CSF). Side effects are rare and cephaolsporins are considered to be among the safest antibiotics in use.

5.2.1 First generation cephalosporins

They are effective against gram-positive aerobes and ineffective against many gram-positive aerobes.
Preparations available in EVD: Cephalexin

5.2.2 Second generation cephalosporins

This group has broader spectrum of activity than the first generation and have good activity against gram-positive and gram-negative organism. They are not widely used in veterinary medicine.
Preparations available in EVDL: Cefuroxime

5.2.3 Third generation cephalosporins

They have an extended spectrum of action against gram-negative organisms, are resistant to β-lactamase, and penetrate the blood-brain barrier.
Preparations available in EVDL: Cefotaxime and Ceftriaxone

5.3 Penicillins

Many Penicillins are broken down by gastric HCl and are thus poorly absorbed orally. The distributions of Penicillins are confined mostly to the extracellular spaces, but clinically effective concentrations in most tissues occurs except for the CNS, bones, prostate, and eye.

Penicillins are generally administered IM except for the acid-stable Penicillins which are administered orally.

Allergic reactions to Penicillin may occur in animals, especially cattle and signs include skin eruptions, angioedema, and anaphylaxis. Procaine salts of Penicillin should not be used in poultry because these species are sensitive to procaine.

5.3.1 Narrow spectrum Penicillins

These are mainly active against gram-positive organisms, but are inactivated by beta-lactamases. Benzathine penicillin is given IM and provides low levels of Benzyl penicillin for up to 4 weeks. Benzyl penicillin (Penicillin G) is administered parenterally and remains the treatment of choice for susceptible infections.

Procaine penicillin is an IM preparation designed to extend the half-life of Benzyl penicillin. It provides blood levels for up to 24 hrs, but these are adequate only against highly susceptible organisms.

5.3.2 Moderate spectrum Penicillins

These Penicillins have greater activity against some gram-negative organisms than narrow spectrum but are destroyed by beta-lactamase producing strains. They have no anti-pseudomonal activity.

Preparations available in EVDL: Benzathine penicillin, Streptopenicillin, Amoxycillin, Ampicillin, Ampicillin-cloxacillin and Procaine penicillin G.

5.4 Chloramphenicol group

Chloramphenicol is a broad-spectrum antibiotic with a range of activity that includes Gram-positive and Gram-negative bacteria, rickettesiae and chlamydiae. Chloramphenicol is not allowed for use in food-producing animals because the potential danger of residue-induced toxicity in humans.

Chloramphenicol is rapidly absorbed from the GI tract and widely distributed to all tissues including the CNS and eye. Chloramphenicol

is administered orally, IM, IV, or SC every 6-8 hrs to dogs, birds, or horses and every 12 hrs to cats.

Dose-related anaemia may occur in animals. Anorexia and diarrhoea may occur especially in cats with high or prolonged dosage. Chloramphenicol use is restricted to topical application.

Preparations available in EVDL: Chloramphenicol.

5.5 Macrolides

Macrolides are bacteriostatic. They are active primarily against gram-positive aerobes and anaerobes and Mycoplasma spp.

Macrolides are absorbed orally if protected from gastric acid destruction by enteric coated preparations or administration of the stable, esterified salts. They are weak organic bases that are widely distributed to all tissues except those of the CNS. They are concentrated in acidic environments like the respiratory secretions, milk, and leukocytes.

Common side effects include mild GI upset with oral doses, and pain and irritation at IM injection sites.

Preparations available in EVDL: Erythromicin and Tylosin

5.6 Nitrofurans

They are broad spectrum and bacteriostatic. Nitrofurans may not be used in food-producing animals (including topically) because they have been shown to be potential carcinogens in laboratory animals.

Preparations available in EVDL: Nitrofurazone

5.7 Nitroimidazoles

Nitroimidazoles is bactericidal against most obligate anaerobes and is active against protozoa, including Giardia and Trichomonas Spp.

Metronidazole is well absorbed orally and widely distributed, including the CNS.

Metronidazole is administered orally twice a day in dogs, cats, and horses. High or prolonged dosage may produce neurotoxicity with signs that include nystagmus, ataxia, and seizures.

Preparations available in EVDL: Metronidazole

5.8 Quinolones

Quinolones are broad spectrum antibacterial and exert action by inhibiting topoisomerase II. They have bactericidal activity.

Preparations available in EVDL: Enrofloxacin and Ciprofloxacin.

5.9 Sulfonamides and trimethoprim

Sulfonamides are bacteriostatic agents. This causes folic acid deficiency resulting in injury to the bacterial cells.

Trimethoprim is synergist with sulfonamides.

Preparations available in EVDL: Sufadimidine, Sulfadiazine and trimethoprim, Sulfanilamide and Sulphamethoxazole

5.10 Tetracyclines

Tetracyclines have a broad spectrum of activity, which includes Gram positive and Gram negative bacteria, Chlamydia, Rickettsia, Mycoplasma, spirochetes, some non-tuberculous mycobacteria and some protozoa. They are usually bacteriostatic. They have good tissue penetration but do not enter CSF.

Tetracyclines are administered orally or IV every 8-12 hrs. IM injections produce pain, irritation, and sterile abscesses unless special buffered solutions are used. Oral therapeutic doses should be avoided in adult ruminants and used with caution in horses because of the danger of disrupting ruminal gastric or colonic microflora,

respectively. Side effects include permanent staining of unerupted teeth in young animals. Oral Tetracyclines should not be used with herbivores because of serious effects on ruminant digestion.

Preparations available in EVDL: Tetracycline, Oxytetracycline and Doxycycline

5.11 Peptides

Peptides are antibacterial agents which exert action by inhibiting bacterial cell wall synthesis. Clinical use of this drug is limited by their toxicity.

Preparations available in EVDL: Colistin.

6. Ideal Antibiotic & Choice of Antibiotics

For the treatment of a bacterial infection, the antimicrobial agent selected must have activity against the causative pathogenic microorganism and must attain effective concentrations at the site of infection.

An Ideal Antibiotic

1. Bacteria should no develop resistant to that drug.
2. Should be effective in presence of body fluids and exudates.
3. Bactericidal level of the drug should reach blood, tissue and CSF immediately and remain maintained for a long period of time.
4. Should be non-toxic.
5. Should be excreted in urine.
6. Should exhibit selective and effective antimicrobial activity.
7. Should be bactericidal rather than bacteriostatic.

Choice of Antibiotic

When an antimicrobial is indicated, the choice should be based on factors such as

1. Identification of the infecting organism and its known or potential susceptibility
2. Host factors
3. Age – specially be cautious of extremes of age

4. History of previous antibiotic exposures and hypersensitivities
5. Genetic or metabolic abnormalities
6. Pregnancy
7. Hepatic and renal functions
8. Immune status
9. Site of infections
10. Safety including adverse reactions and drug interactions,
11. Previous clinical experience,
12. Cost
13. The potential for selection of resistant organisms and
14. The associated risk of super-infection.

An adequate history of previous adverse reaction to drugs may prevent the inadvertent administration of an antimicrobial drug to which the animal is allergic. A failure to do so can have serious (and sometimes fatal) consequences.

7. Correct Dosage and Route of Administration

The dose selected should result adequate therapeutic concentrations at the site of infection without causing side effects or toxicity. In practice, one works from recommended dose.

7.1. **Recommended dose** is one that will give blood and tissue levels, which will be effective against very susceptible organisms, with minimal side effects to the host.

7.2. **Intravenous route** administered antibiotics attain high and immediate blood and tissue levels and this route should be used in the treatment of septicemia and other life threatening/chronic diseases. The concentrations obtained are much higher than those obtained with equivalent doses of same drug given intramuscularly or orally, and consequently greater diffusion concentrations are achieved at sites of infection. The intravenous route is used for low-concentration high volume antimicrobial agents such as sulphamethazine and Oxytetracycline. Drugs specifically formulated for intravenous administration use should be used. Severely toxemic terminal cases may die immediately following injections.

7.3. **Intra-muscular route** is the most commonly used method in large animals. Where possible this route should be avoided in meat-producing animals, especially with irritant preparations.

7.4. **Oral route** is generally restricted to pre-ruminant animals, young foals and pigs. Thus method is the easiest method for administration and where the cost of revisits is a significant consideration; this route is often chosen for continuing medication, as it will be easy for any owner. In general, however systemic infections are better treated by parental route.

8. Duration of Treatment

As a rule of thumb, antibiotic therapy should be continued for 3-5 days and the treatment should continue for 1-2 days after the resolution of clinical signs. Chronic infections, skin infections, osteomyelitis, infections in immuno-suppressed animals, and infections with intracellular pathogens often require markedly longer treatment periods and as a general rule treatment should continue for 1-2 weeks beyond resolution of clinical signs. Recommendations on treatment duration are given in more detail in the disease-specific and species specific treatments. It is also important that treatment is not continued longer than necessary to avoid unnecessary use of antibiotics.

9. Antibiotics in pregnant animals

There is no drug or medicine that can be called safe during pregnancy. Hence, the use of antibiotics should be done cautiously in pregnant animals especially metronidazole. However, Penicillins, Cephalosporins and Erythromicins are considered safe to be used in pregnant animals.

10. Anti-Microbial Resistance (AMR)

Antimicrobial resistance (AMR) is resistance of a microorganism to an antimicrobial medicine to which it was originally sensitive. Resistant organisms (bacteria, fungi, viruses and some parasites) are able to withstand the attack by antimicrobial medicines. Hence, the standard treatments become ineffective,

infections persist increasing risk of spread to others. The evolution of resistant strains is a natural phenomenon that happens when micro-organisms are exposed to antimicrobial drugs, and exchange of resistant traits occurs between certain types of bacteria. Over-use and misuse of antimicrobial medicines accelerates this natural phenomenon. Poor infection control practices encourage the spread of AMR.

10.1 Mechanism of resistance

- Production of inactivating enzymes. Eg. -lactamase enzyme hydrolyses Penicillins and renders it inactive.
- Tranferase enzyme inactivates amino-glycosides.
- Changes in permeability or drug uptake.
- Changes in structure of receptors or the target molecules. Such changes include ribosomal components with which the antibiotics interact. Eg. Erythromicin
- Development of alternative metabolic pathways. Eg. Sulphonamides inhibit dihydrofolate synthetase enzyme thus dihydrofolic acid is inhibited.
- Changes in structure of target enzymes may decrease the drug affinity.
- Exchange of antimicrobial resistance genes among the organisms.

10.2 How to avoid resistance

- avoiding indiscriminate use.
- starting the therapy as early as possible.
- providing adequate dosage.
- concurrent therapy with two or more antibacterial agents.
- Treatment based on culture and sensitivity wherever possible.

11. Withdrawal Period (WP)

Withdrawal periods is the time necessary for an animal to metabolize an administered product and the amount of time necessary for the product concentration level in the tissues to decrease to a safe, acceptable level. The normal range of withdrawal period for food animals for meat ranges from 0-60 days. There are different withdrawal period for different drugs and are mentioned in the (please refer table) against each antibiotic.

The withdrawal period in food animals are necessary to curb the antibiotic residues in food which might result in allergies to human and also antimicrobial resistant development.

Withdrawl periods should be strictly followed in food animals. The antibiotic residues on food products are being regulated by BAFRA for the public safety concerns.

12. Uses of Antibiotics in animals

With the recent development of AMR, the use of antibiotics in animals should be prudent and judicious. The use of antibiotics can be minimized by good management practices like vaccination and good biosecurity.
However, the antibiotics are used for following reasons in animal:

12.1 **Therapeutic use:** Antimicrobials are used for treatment of diseases. The infected animals receive a course of antibiotics, which usually involves high doses for a relatively short period of time.

12.2 **Non-therapeutic use**

12.2.1 Growth promoters: The use of growth promoters is characterized by administration of very low-dose of antibiotics on a regular basis, mostly over a lifetime of the food-producing animal and is given through feed to increase growth-rate and productivity. Studies have revealed that use of antibiotics in feed as growth promotors is the one of the sources of AMR and hence, Bhutan doesn't permit the use of antibiotics in feed.

12.2.2 Prophylactic and metaphylactic use: The use of antibiotics to animals that are not clinically ill but are the high risk of getting infection. For example, animals are administered with antibiotics before surgery, during viral infections, transportation of animals and dry cow therapy to combat infection. Prophylactic use of antibiotics can be a substantial aid in the control and prevention of diseases

in animals however the use of antibiotics should never be a replacement for good management practices, as the use will eventually lead to resistant development.

13. Usage of Antibiotics in Post-operative care in animals

The use of antibiotics after a surgery should not be a substitute for a sterile environment for surgery. Hence, the recommendation is to use the antibiotics prior to surgery and continue after surgery. However, antibiotics are recommended for the surgical procedure which takes more than 90 minutes. For elective orthopaedic surgeries, bowel surgeries and periodontal surgeries; the recommended antibiotics are Penicillin G, Ampicillin, and Amoxicillin and if anaerobes are suspected metronidazole can be administered.

However, the use of post-operative antibiotics should not be a substitute for poor surgical environment.

14. Regulation

Use of antibiotics in the animal feed and also food products of animal origin are being regulated by Bhutan Agriculture and food Regulatory Authority (BAFRA). Antibiotics for therapeutic purposes are regulated by Drug Regulatory Authority (DRA) as per the Medicine Act of Kingdom of Bhutan 2003 and Bhutan Medicine rules and Regulations 2012.

15. Guidelines for Pet animals (Dogs and cats)

Disease	Common agent	Recommended medicine	Alternative medicine	Remarks
1. Infections of Cardio-Vascular System				
1.1 Infective Endocarditis	Staphylococcus, Streptococcus, Corynobacterium, E. coli	Penicillin G @ 10,000-25,000IU/kg BW, IM twice a day for 4 weeks OR Ampicillin & Cloxacillin @ 10mg/kg BW, IM/IV four times a day for 6-8 weeks	Gentamicin @6-8mg / kg BW, IV/IM every 12hrs for two doses then every 24 hrs for 5 days	Gentamicin should not be used for more than a week (ototoxicity and nephrotoxicity).
2. Infections of Digestive system				
2.1.Periodontal diseases	Porpxyphy-romonas sp.	Doxycycline @ 5-10mg/kg BW, PO every 12hrs for 2 weeks	Metronidazole @ 20mg/kg BW, IV daily in divided doses or 25-50mg/kg BW, PO in divided doses for 5 days.	CST
2.2.Chronic Gastritis	Helicobacter	Amoxicillin @ 10-20mg/kg BW, PO twice daily for 2-3 weeks	Metronidazole @10mg /kg BW, PO, IV every 12hrs for 2 weeks	CST is recommended
2.3. Enteritis	Viral (Parvovirus, Corona virus) Bacterial (Salmonella, Clostridium)	Cephalexin @ 22mg /kg BW, PO three times daily WITH Metronidazole (dose as above 2.2)	Amikacin @ 15-20mg/kg BW, IM/ IV/SC daily for 5-7 days OR Amoxicillin @ 10-20mg/kg BW, PO twice daily for 5 days WITH Metronidazole	In Viral infections, the use is to prevent secondary bacterial infection.

			(dose as above, 2.2)	
2.4. Peritonitis	Enteorbactericeae	Strepto-Penicillin @ 40000 IU/kg BW, IM 5-7 days	Amikacin (Dose as above, 2.3)	CST
2.5. Cholangitis	E. coli	Amoxicillin @ 10-20mg/kg BW, PO 4 to 6 weeks	Gentamicin @ 6-8mg/kg BW, IV/IM every 12hrs for two doses then every 24 hrs for 5 days	CST
3.0 Infections of Ear/Eye				
3.1. Otitis	Staphylococcus, Streptococcus, Micrococcus	Gentamicin ear drop 1-2 drops, apply 2-3 times daily OR Strepto-Penicillin @ 40000 IU/kg BW, IM every 24h for 5-7 days in deep infections	Amoxicillin @ 10-20mg/kg BW, PO twice daily for 5 days	CST
4.0 Infections of Musculo-skeletal system				
4.1.Arthritis	Streptococcus staphylococcus	Amoxicillin @ 10-20mg/kg BW, PO/IM every 12 hrs for 5 days	Enrofloxacin @ 2.5-5mg/kg BW, PO divided dose daily for 7days.	Based on CST
5.0 Infections of Nervous System				
5.1.Meningoencephalitis	Canine distemper virus, Streptococcus, Staphylococcus, Pseudomonas, Listeria	Ampicillin @ 20mg/kg BW, PO four times daily or 10mg/kg BW, IM/IV/SC for 5 days	Cefotaxime @ 20-50mg/kg BW, IV twice daily for 5 days. After recovery oral therapy should be continued for 4 weeks.	Viral infections, the use is to prevent secondary bacterial infection

6.0 Infections of Respiratory System				
6.1.Upper Respiratory Infection (URIs)	Feline herpes virus and Calci virus, Bordetella, Mycoplasma	Strepto -Penicillin @ 40000IU/kg BW, IM Ampicillin @ 22mg/kg BW, PO every 8hrs OR Amoxicillin @ 10-20mg/kg BW, PO every 12hrs for 3 to 5 days.	Enrofloxacin @ 2.5-5mg/kg BW, PO divided dose daily for 7days. OR Doxycycline @ 5-10mg/kg BW, PO every 12hrs for 5 days	CST
6.2.Bacterial Pneumonia	Staphylococcus, Streptococcus, Bordetella, E coli, Mycoplasma	Amoxicillin (dose as above, 6.1)	Doxycycline (dose as 6.1) OR Cephalexin @ 22mg /kg BW, PO three times daily for one week	Antibiotic therapy should continue at least for 1 week after the clinical signs have resolved.
7.0 Infections of Uro-genital system				
7.1 Urinary Tract Infection (UTI)	E coli, Corynebacterium, Clostridium	Trimethoprim + sulfamethaxazole @ 15mg/kg BW, IM/IV every 12hrs for 3 days.	Amoxicillin @ 10-20mg/kg BW, PO every 12hrs for 7-14 days	CST
8.0 Infections of Skin				
8.1 Abscess	Staphylococcus, Streptococcus, Pseudomonas	Strepto-Penicillin @ 40000 IU/kg BW, IM every 24hrs for 7-10 days or until lesions are completely healed	Amoxicillin @ 10-20mg/kg BW, PO every 12 WITH Gentamicin 2-4mg/kg BW, IV/IM 12hrs for two doses then every 24hrs for 5 days.	CST

8.2 Pyoderma	Staphylococcus, Streptococcus, Pseudomonas	Strepto-Penicillin (dose as above, 8.1) OR Cephalexin @ 20-40mg/kg BW, PO every 8hrs continued to 3-4 weeks & continued one week beyond complete clinical and cytological resolution	Amoxicillin WITH Gentamicin (dose as above, 8.1)	Topical shampoos also to be used
8.3 Wound	Staphylococcus, Streptococcus, Pseudomonas	Strepto-penicillin (dose as above, 8.1) OR Cephalexin (dose as above, 8.2)	Amoxicillin WITH Gentamicin (dose as above, 8.1)	
8.4 Exudative dermatitis (Hot spot)	Staphylococcus, Streptococcus,	Enrofloxacin @ 2.5 - 5mg/kg BW, IM divided doses daily for 14 days	Strepto-penicillin (dose as above, 8.1)	
9.0 Infections of Reproductive System				
9.1 Metritis	Staphylococus, Streptococus, E coli, Proteus, Corynebacterium, Brucella	Amoxicillin @ 10-20mg/kg BW, PO every 12hrs	Cephalexin @ 20-40mg/kg BW, PO every 8hrs WITH Gentamicin 3-5mg/kg BW, IV/IM 12hrs for two doses then every 24hrs for 5 days.	CST

16. Guidelines for cattle

Disease	Causative agent	Recommended medicine	Alternative medicine	Remarks
1.0 Infections of Digestive system				
1.1 Actinobaccilosis	Actinobaccilosis lignieresii	Trimethoprim & Sulphadiazine (80mg & 400mg/ml) @ 25mg/kg BW, IM daily for 3-5 days	Streptomycin Injection @10mg/kg BW, IM daily for 3-5 days	Oral or intravenous of Iodides. Potassium iodide @ 6-10 gm/day for 7-10 days orally. W.P. of Trimethoprim & Sulphadiazine: 12 days (meat), 2 days (milk) W.P. for Streptomycin: 60 days (meat), 4 days (milk)
1.2 Calf Scour	Echerichia Coli	Trimethoprim & Sulphadiazine (dose as above, 1.1)	Doxycycline hyclate @ 5mg/kg BW, PO every 12 hours for 3- 5 days however, should be based on the severity of the conditions.	W.P. of Trimethoprim & Sulphadiazine: as above (1.1) W.P. of Doxycycline: 8 days (meat)
1.3 Gastroenteritis	Echerichia Coli, Salmonella, Clostridium perfringens type E & C	Ampicillin @ 5-10mg/kg BW, IM/IV daily for 3-5 days.	Cephalexin @ 5-10mg/kg BW, PO twice daily WITH Gentamycin@4.4-6.6mg/kg BW, IM daily for 5 days OR	W.P. for Ampicillin 6 days (meat); 2 days (milk). W.P. for gentamycin: 18 months(meat); 5 days (milk) W.P. for Cephalexin: 4 days(meat), none (milk)

			Amikacin@ 25mg/kg BW, IM twice daily for 5 days.	*Avoid Amikacin in food animals*
2.0 Infections of Musculoskeletal system				
2.1Actinomycosis	Actinomyces bovis	Trimethoprim & Sulphadiazine (80mg & 400mg/ml) @ 25mg/kg BW, IM daily for 3-5 days	Streptomycin Injection @10mg/kg BW, IM daily for 3-5 days	Oral or intravenous of Iodides. Potassium iodide @ 6-10 gm/day for 7-10 days orally. W.P. for Trimethoprim & Sulphadiazine: as above (1.1) W.P. for Streptomycin as above (1.1)
2.2 Black Quarter	Clostridium Chauvii	Benzathine Penicillin 12000 IU/kg BW, deep IM repeat after 48 hrs.	Metronidazole @ 20 mg/kg BW, IV in divided doses for 3-5 days.	W.P. for Benzathene Penicillin: 30 days (meat). *Avoid metronidazole in food animals.*
2.3 Navel/ Joint ill	Streptococcus spp. Escherichiacoli, Corynebacterium & Pasturella	Benzathine Penicillin (dose as above, 2.2)	Streptomycin @10mg/kg BW, IM WITH Trimethoprim & Sulphadiazine (dose as above, 2.1)	Surgical & antiseptics can be used in treatment of advanced abscess W.P. for Streptomycin: as above (1.1) W.P. for Trimethoprim & Sulphadiazine: as above (1.1)
3.0 Infections of Respiratory System				

3.1 Bovine Respiratory Disease	Mutifactoral Disease involving stress, Viruses and Bacteria. (Bacterial agent involved: Pastuerella Multocida)	Procaine G Penicillin @ 8000 IU/kg BW WITH Streptomycin sulphate @ 10mg/kg (Strepto-penicillin) 2ml/50kg BW IM for 3-5 days.		W.P. of Procaine Penicillin & Streptomycin: 60 days (meat), 4 days (milk)
3.2 Pneumonia	Mannheimia haemolytica serotype 1 Pasteurella multocida	Procaine G Penicillin (dose as above, 3.1)	Oxytetracycline LA @ 5-10mg/kg BW, IM every 48 to 72 hrs.	Injection at one site should not exceed 6 ml W.P. of Procaine Penicillin & Streptomycin: as above (3.1) W.P. for Oxytetracycline LA 28 days (meat), 4 days(milk)
4.0 Infections of Urogenital system				
4.1Pyometra/ Metritis	Campylobacter spp, Staphylococcus spp, Streptococcus spp.	Oxytetracycline LA @ 20mg/kg BW, IM every 48 to 72hrs. OR Oxytetracyline HCl) (short acting) @ 11mg /kg BW, IM every 12-24hrs daily for 3 - 5 days.	Ampicillin & Cloxacillin @ 5-10 mg/kg BW, IM/IV/ SC four times daily for 3-5 days. OR Gentamycin@ 4.4-6.6 mg/kg BW, IM daily three times for 3-5 days.	Administration of PGF2 α or its analogs at normal luteolytic doses. W.P. for Oxytetracycline LA: as above (3.2) W.P. for Oxytetracycline Hcl: 22 days (meat) W.P. for Ampicillin & Cloxacillin: 30 days(meat), 2 days (milk)

				W.P. for gentamycin: as above(1.3)
4.2 Leptospirosis	Leptospira spp	Streptomycin/ dihydrostreptomycin @ 25 mg/kg BW, IM daily for 5 days	Porcaine Penicillin G @ 40,000 IU/kg BW, IM daily for 5 days	Treatment should not exceed 7 days in non-lactating dairy and beef cattle, or 5 days in lactating dairy cattle. W.P. for streptomycin/dihydrostreptomycin: 60 days(meat), 4days (milk) W.P. for Procaine penicillin G: 60 days (meat), 4 days (milk)
4.3 Brucellosis	Brucella abortus	Streptomycin @ 25mg/kg BW, IM once a day for 8 days	Oxytetracycline LA @ 25 mg/Kg BW, IM every 3 days for 42days.	Prevention can be done by calf hood vaccination using *b. abortus strain 19* W.P. for OxytetracyclineLA: as (3.2) W.P. for streptomycin: as above (4.2)
4.4 Orchitis	Mycoplasma bovis Brucella abortus Mycobacterium tuberculosis	Cephalexin @ 5-10mg/kg BW, PO twice daily	Oxytetracycline LA @ 20mg/kg BW, IM every 48hrs to 72hrs.	W.P. for Cephalexin: as above (1.3) W.P. for Oxytetracycline: as above(4.1)

4.5 Endometritis	Trueperella pyogenes, Fusobacterium necrophorum	Oxytetracycline Hcl @ 10mg/kg BW, IV once daily for a week.	Ceftriaxone and Tazobactum @ 5-10mg/kg BW, IM/IV daily for 5 days.	Administration of PGF2 α or its analogs at normal luteolytic doses. W.P. for Oxytetracycline: as above (4.1) W.P. for Ceftriaxone and Tazobactum: 16 days(meat) 4 days(milk)
5.0 Infections of Mammary Gland				
5.1 Streptococcal Mastitis	s. agalactiae s. dysagalactiae s. uberis Enterococci	Procaine Penicillin100,000IU Streptomycin sulphate 100mg, sulphamerazine 500mg, hydrocortisone acetate 29mg intramammary infusion one tube every quarter 12 hrs 1 to 3 instillations	Cloxacillin 200mg and Ampicillin 75mg intramammary infusion 12 hourly in each affected quarter for 1 to 6 instillations	ABST to assess the level of resistance. As last resort only Cephalosporin should be used. W.P. for Procaine Penicillin & streptomycin is 4 days post calving. W.P. for Cloxacillin & Ampicillin: 2 days

5.2 Staphylococcal mastitis	Staphylococcus aureus Coagulase negative s. cocci β lactamase – ve Coagulase negative s.cocci β lactamase +ve	Procaine Penicillin 100,000 IU Streptomycin sulphate 100mg, sulphamerazine 500mg, hydrocortisone acetate 29mg intramammary infusion one tube (dose as above, 5.1)	Cloxacillin 200mg and Ampicillin 75mg intramammary infusion (dose as above, 5.1)	ABST W.P. for Penicillin with Streptomycin and Cloxacillin with Ampicillin :as above (5.1)
5.3 Coliform Mastitis	Escherichia coli	Oxytetracycline @ 10mg/kg BW, IV once daily for a week (for clinical form) with other supportive treatments.	Cephalexin @ 5-10mg/kg BW, PO twice daily for 5 days	If mixed infection with other gram positive bacteria, use intra-mammary infusions. W.P. for Oxytetracycline: 4 days W.P. for Cephalexin: none
5.4 Dry cow therapy		Cloxacillin 200mg and Ampicillin 75mg intramammary infusion at " drying off"		W.P. for Cloxacillin & Ampicillin: 30 days (meat)
6.0 Other Septicemic Infections				
6.1 Anthrax	Bacillus anthracis	Benzathine Penicillin @ 12000 IU/kg BW, deep IM repeat after 48 hrs.	Oxytetracycline LA @ 20mg/kg BW, IM every 48hrs to 72hrs.	Refer anthrax guidelines for detail control W.P. for Benzathene Penicillin and

				oxyteracycline: as above (2.2 and 1.1)
6.2 Hemorrhagic septicemia	Pasturella multocida	Sulphadimidine @ 200mg/kg BW or 15-30ml/50kg BW, (conc.33.33 % w/v) SC in calves & IV in milking cows as initial dose and 100mg/kg BW or 7.5-15ml/50kg BW, SC/IV as above for maintenance for 5 days	Penicillin G @ 8000 IU/kg BW, IM once daily for 3-5 days. OR Streptomycin @10mg/kg BW, IM daily for 3-5 days.	W.P. for sulphadimidine: 8 days(meat); 4 days(milk) W.P. for Penicillin and streptomycin: as above (2.2 and 4.2)

17. Guidelines for small ruminants (Sheep & Goats)

Diseases	Causative agent	Recommended medicine	Alternative medicine	Remarks
1.0 Infections of Respiratory system				
1.1Caprine pleuropnuemonia	Mycoplasma capricolum M. ovipneumonae	Tretracycline Hcl @ 11mg/kg BW, PO twice daily for 3-5 days.	Doxycyline @1-2mg/kg BW, PO daily for 3-5 days	*Diseases incidences are reduced by good hygiene and husbandry practices.* W.P. for Tetracycline Hcl: 5 days (water & feed) W.P. for Doxycyline:8 days (meat)
1.2 Pneumonia	P. multocida, M. hemolytica	Oxytetracycline LA @ 5-10 mg/kg BW. IM/IV follow after 3-4 days	Ampicllin@5-10 mg/kg BW, IM/IV/ SC four times daily for 3-5 days.	W.P. for Oxytetracycline: 29 days W.P. for Ampicillin: 10 days
2.0 Infections of Digestive System				
2.1 Enterotoxemia	Clostridium perfringens	Sulphadimidine @200mg/kg(2 boli/50kg BW) PO followed by 1boli/50kg BW, for further 2 days only	Penicillin G @ 6600 IU/kg BW, IM daily for 3-5 days *The daily treatment schedule should not exceed 7 days of treatment*	Treatment as antitoxin against Enterotoxemia caused by *Closridium perfringens* available for prevention W.P. for Sulphadimidine: 8 days W.P. for Penicillin G: 9 days (meat)
3.0 Infections of Musculoskeletal System				
3.1 Joint ill	Erysipelothrix rhusiopathiee, Staphylococus spp.	Metronidazole @ 10mg/kg BW, IV daily for 7 days.	Sulphadimidine @200mg/kg(2 boli/50kg BW) PO	Surgical & antiseptics can be used in treatment of advanced abscess

			followed by 1boli/50kg BW for further 2 days only	Avoid use of Metronidazole in food animals. W.P. for Sulphadimidine: as above (2.1)
3.2 Foot Rot	Dichelobacter nodusus	Oxytetracycline Hcl @ 5-10mg/kg BW, IM/IV daily for 5-7 days	Penicillin G @ 10000 IU/Kg BW, IM daily for 5 days	Foot bathing - walk through or standing in for 5-10 mins, Zinc sulphate 10% - 1kg to 9 liters water, formalin 5%- 1 part formalin to 90 parts water. W.P. for Oxytetracycline Hcl: 29 days W.P. for Penicillin G: 9 days (meat)
4.0 Other infections				
Pasteurellosis	Manhemmia hemolytica Pastuerella multicida	Sulphadimidine (dose as above. 3.1)	Ampicllin@5-10 mg/kg BW, IM/IV/SC four times daily for 3-5 days. OR Enrofloxacin @ 2-5mg/kg BW, SC daily for 3-5 days or 7.5mg-12.5mg/kg BW, SC single dose.	W.P. for Sulphadimidine: as above (2.1) W.P. for Ampicillin: 28 days W.P. for Enrofloxacin: 4-6 days (meat)

18. Guidelines for Equines

Disease	Common causative agent	Recommended medicine	Alternate medicine	Remarks
1.0 Infections of Circulatory system				
1.1 Cardiac infection	Streptococcus spp. Actinobacillus, Pasteurella, Actinobacillus sp.	Benzathine Penicillin @ 12000 IU/kg BW, deep IM every 2 days WITH Gentamicin: Adult: @ 6.6mg/kg BW, IM/SC daily Foals: @7mg/kg BW, IM/SC daily repeat for 18-24hrs for 7 days or until the signs and symptoms disappear	Trimethoprim & Sulphadiazine (80mg & 400mg/ml) @ 1ml/30 kg BW, IM daily for 3-5 days OR 22mg/kg BW, IV 24hrs OR 30mg/kg BW, PO 24hrs	Gentamicin is not recommended with Phenyl Butazone
2.0 Infections of Hepatic system				
2.1Hepatic infection	E. coli, β-Haemolytic streptococci, Rhodococcus equi	Gentamicin: Adult: @ 6.6mg/kg BW, IM/SC Foals: @7mg /kg BW IM/SC daily repeat for 18-24hrs for 7 days or until the signs and symptoms disappear OR	Penicillin G @ 10000-50000 IU/kg BW, IM /SC twice daily for 7days WITH Gentamicin: Adult: @	

		Penicillin @ 12000IU/kg BW, deep IM 5-7days OR Trimethoprim & Sulphadiazine (80mg & 400mg/ml) as above 1.1	6.6mg/kg BW, IM/SC daily Foals: @7mg /kg BW, IM/SC daily repeat for 18-24hrs for 5-7 days or until the signs and symptoms disappear	
3.0 Infections of Digestive system				
3.1Bacterial Enteritis	Clostridial difficile, C. perfringens	Metronidazole @ 20-25mg/kg BW, IV IM or PO 12 hrs for 5 days	Penicillin G @ 10000-50000 IU/kg BW, IM /SC twice daily for 7days	
4.0 Infections of Eye				
4.1Bacterial conjunctivitis	Various causes	Gentamicin eye drops, twice daily until the clinical signs disappear	Ciprofloxacin eye drop, twice daily until the clinical signs disappear	Conjunctivitis is not usually caused by bacterial infection but animals can get secondary infection.
4.2 Corneal laceration/ perforation	Various causes	Penicillin G @ 12000IU/kg BW, deep IM for 5-7days WITH Gentamicin: Adult: @ 6.6mg/kg BW, IM/SC daily Foals: @7mg /kg BW,IM/SC daily repeat for 18-24hrs for	Trimethoprim & Sulphadiazine (80mg & 400mg/ml) @ 1ml/30 kg BW, IM daily for 3-5 days or 22mg/kg BW, IV 24hrs or	Concurrent aggressive medical & surgical treatment required. Amikacin is not recommended with Phenyl- butazone

		3-5 days or until the signs and symptoms disappear	30mg/kg BW, PO 24hrs OR Amikacin @ 15-25mg/kg BW, IM/IV every 24hrs for 5 days	
4.3Corneal ulceration	Various causes	Gentamicin eye drops, twice daily	ciprofloxacin eye drops WITH Trimethoprim & Sulphadiazine (dose as above, 4.2) OR Ampicillin @ 5-10mg/kg BW, IV/ IM four times daily for 5-7 days.	
5.0 Infections of Skin				
5.1Pastern dermatitis (scratches, mud fever, grease heal)	S. aureus Staphylococci D. Congolensis β-haemolytic streptococci	Penicillin G @ 12000 IU/kg BW, deep IM for 5-7days	Trimethoprim & Sulphadiazine (80mg & 400mg/ml)@ 1ml/30 kg BW, IM daily for 3-5 days	Topical treatment with povidone-iodine OR chlorhexidine shampoo
6.0 Infections of Musculoskeletal System				
6.1Clostridial Myositis	C. perfringens	Penicillin G @ 12000 IU/kg BW, deep IM for 5-7days	Metronidazole @20-25mg/kg BW,	

			IM/IV PO 12 hourly for 5 days	
6.2Wounds (surgical & penetrating)	Various, including anaerobes	Penicillin G (dose as above, 6.1) WITH Gentamicin: Adult: @ 6.6mg/kg BW, IM/SC daily Foals: @7mg /kg BW, IM/SC daily repeat for 18-24hrs for 3-5 days or until the signs and symptoms disappear	Oxytetracycline Hcl. (SA) @ 2-5mg/kg BW, IM 12hrs for 3-5 days	
7.0 Infections of Nervous system				
7.1Ear infection/otitis(interna -media)	Streptococcus Actinobacillus Other	PenicillinG @12000 IU/kg BW, IM for 5-7 days WITH Gentamicin: Adult: @ 6.6mg/kg BW, IM/SC Foals: @7mg /kg BW, IM/SC daily repeat for 18-24hrs for 3-5 days or until the signs and symptoms disappear	Trimethoprim & Sulphadiazine (80mg & 400mg/ml) @ 1ml/30 kg BW, IM daily for 3-5 days	. Gentamicin not recommended with Phenyl butazone
7.2 Tetanus	Clostridium tetani	Metronidazole @20-25mg/kg BW, IM/IV/	Penicillin G (dose as above, 7.1)	.

		PO 12 hourly for 10 days		
8.0 Infections of Respiratory system				
8.1Bacterial pneumonia	S.equi sub. Zooepidemicus, Staphylococcus, Actinobacillus, E. coli, Klebsiella spp.	Penicillin G @ 12000 IU/kg BW, IM for 5-7 days	Trimethoprim & Sulphadiazine (80mg & 400mg/ml) @ 1ml/30 kg BW, IM daily for 3-5 days	Perform CST
8.2 Pneumonia in Foals	Rhodococcus equi	Doxylcycline @ 10 mg/kg BW, PO 12 hrs or 20mg/kg BW, PO 24 hrs for 5 days	Trimethoprim & Sulphadiazine (dose as above, 8.1)	Risk of clostridial colitis to mares in certain geographic Regions
8.3 Strangles	Streptococcus equi sub. Equi	Penicillin G (dose as above, 8.1)	Trimethoprim & Sulphadiazine (dose as above, 8.1)	
9.0 Infections of Uro-genital system				
9.1 Urinary Tract infection	Gram negative bacteria: E. coli Proteus Pseudomonas, Klebsiella, Enterobacter Gram Positive bacteria: Streptococcus Staphylococcus	Trimethoprim & Sulphadiazine (80mg & 400mg/ml) @ 1ml/30 kg BW, IM daily for 3-5 days	Penicillin @ 12000IU/kg BW IM for 5-7 days WITH Gentamicin: Adult: @ 6.6mg/kg BW, IM/SC Foals: @7mg /kg BW, IM/SC daily repeat for 18-24hrs	Gentamicin not recommended with Phenylbutazone

			for 7 days or until the signs and symptoms disappear Gentamicin @ 1-2mg/kg BW, IM/SC for 3-5 days	
9.2 Metritis/endometritis/pyometra/placentitis/posthitis	Taylorella Equigenitalis	Mares: infusion with Gentamicin and washing with 4% chlorhexidine for 5 days OR Penicillin G 12000IU/kg BW, deep IM for 5-7days Stallions: Topical Gentamicin And 4% Chlorhexidine for 5 days	Penicillin G OR Gentamicin (dose as above, 9.1)	Best if mares are treated during oestrus. Concurrent uterine lavage may be required.

19. Guidelines for Swine

Disease	Common causative agents	Recommended medicine	Alternative medicine	Remarks
1.0 Infections of Digestive system				
1.1 Neonatal Scour/Piglet scour/Post weaning diarrhea	E. coli C. perfringens C. difficle Salmonella sp.	Trimethoprim & Sulphadiazine (80mg & 400mg/ml) @ 15-30mg / kg BW, IM daily for 3-5 days OR Trimethoprim & Sulphadiazine (2g boli) half boli PO for 3-5 days	Amoxicillin @10mg/kg BW, PO every two times daily for 5 days	W.P. for Trimethoprim & Sulphadiazine: 7 days (injectable); 5 days (oral) W.P. for Amoxycillin: 18 days
1.2 Necrotic Enteritis	C. perfringens C. difficle	Benzathine penicillin @12000 IU/kg BW, IM every 48hrs for 5-7 days.	Amoxicillin (dose as above 1.1) OR Erythromicin @ 2.2-6mg/kg BW, IM for 5 days	Benzathine penicillin shouldn't be continued for 4 consecutive days. Content should not exceed 10 ml per site. W.P. for Benzathine penicillin:30 days W.P. for Amoxicillin: as above W.P. for Erythromicin: 7 days.

1.3 Swine dysentry	B. hyodysenteriae	Erythromicin Dose as above (1.2)	Trimethoprim & Sulphadiazine (80mg & 400mg/ml) (dose as above, 1.1)	Erythromicin is associated with vomition. W.P. for Erythromicin: as above (1.2) W.P. for Trimethoprim & Sulphadiazine: 7 days (injectable); 5 days (oral)
2.0 Infections of Respiratory System				
2.1 Atrophic rhinitis	P. multocida B. bronchiseptica	Trimethoprim & Sulphadiazine (80mg & 400mg/ml) @ 15-30mg / kg BW, IM daily for 3-5 days OR Enrofloxacin @ 2-5mg/kg BW, SC daily for 3-5 days or 7.5mg-12.5mg/kg BW, SC single dose SC. @ 7.5mg/kg BW, SC every 24 hrs 3-5 days.	Amoxicillin @10mg/kg BW, PO every two times daily for 5 days	The dose should not exceed 5 ml per site. W.P. for Trimethoprim & Sulphadiazine: as above (1.3) W.P. for Enrofloxacin: 10 days. W.P. for amoxicillin as above (1.2)
2.2 Enzootic pneumoniae	M. hyopneumoniae	Oxytetracycline (LA) @ 20mg/kg BW, or 1ml/10kg BW, (Deep IM) every 48 hrs 2 to 3 doses Piglets at different ages:	Erythromicin @ 2.2-6mg/kg BW, IM for 5 days. OR Amikacin @ 10mg/kg BW, IM every 24hrs for 5-7 days	Amikacin is nephrotoxic and avoid using with Phenylbutazone. W.P. for Oxytetracycline LA: 28 days

		Day 1: 0.2ml Day 7: 0.3ml Day 14: 0.4ml Day 21:0.5ml Above day 21: 1ml/10kg BW, IM every 48 hrs 2 to 3 doses		W.P. for Erythromicin as above (1.2) W.P. for Amikacin:40 days for neonatal pigs, not advised in food animals
2.3 Pleuro pneumonia	Actinobacillus suis A. pleuropneumonia	Benzathine Penicillin @12,000IU/kg BW, IM every 48hrs for 5-7 days.	Trimethoprim & Sulphadiazine (80mg & 400mg/ml) dose as above (2.2) OR Oxytetracycline (LA) dose as above (2.2) OR Amoxicillin trihydrate dose as above (2.1)	W.P. for Benzathine Penicillin & Trimethoprim & Sulphadiazine, Oxytetracycline & Amoxycillin: as above(1.2 ,2.2,1.3)
2.4 Mycoplasma induced respiratory disease (MIRD)	Mycoplasma hyopneumoniae.	Tetracycline (LA) (dose as above, 2.2)	Erythromicin OR Amikacin (dose as above, 2.2)	W.P. for Oxytetracycline & Erythromicin and Amikacin: as above (1.2, 2.2)
3.0 Infections of Reproductive system				
3.1 Mastitis,metritis, agalactia syndrome (MMA)	Salmonella spp.	Trimethoprim & Sulphadiazine (80mg & 400mg/ml) @ 15-30mg / kg BW, IM daily for 3-5 days	Amoxicillin trihydrate @10mg/kg BW, PO twice daily for 3-5 days. OR	W.P. for Trimethoprim & Sulphadiazine, Amoxicillin: as above (1.2, 1.3)

			Ampicillin @5-10 mg/kg BW, IM four times daily for 5-7 days.	W.P. for Ampicillin:28 days
4.0 Other Septicemic Infections				
4.1 Glasser's disease (arthritis, pericarditis & peritonitis)	Heamophilis parasuis Streptococcus suis	Benzathine penicillin @ 12000 IU/kg BW, IM every 48 hrs for 5-7 days.	Oxyetracycline LA @20mg/kg BW, (Deep IM) every 48 hrs for 7 days.	Don't inject more than 5 ml per site. Don't use OTC (LA) for more than 4 consecutive days. W.P. for Benzathine penicillin. & Oxytetracycline: as above (1.2, 2.2)
4.2 Erysipelas (dermatitis, arthritis, endocarditis)	E. rhusiopathiae M. hyosynoviae	Benzathine penicillin (dose as above 4.1)	Amoxicillin trihydrate @ 11-22mg/kg BW, PO every 4 hrs for 3-5 days	W.P. for Benzathine penicillin & Amoxicillin trihydrate: as above (1.1, 1.2)
4.3 Anthrax	B. anthracis	Benzathine penicillin (dose as above 4.1)	Oxyetracycline (LA)@ 20mg/kg BW, (Deep IM) every 48 hrs for 7 days	Benzathine penicillin shouldn't be continued for 4 consecutive days. Content should not exceed 10 ml per site. W.P. for Benzathine penicillin. Oxytetracycline: as above (1.3, 2.2) (Refer the anthrax guidelines for control)

20. Guidelines for Poultry

Disease	Common causative agent	Recommended medicine	Alternative medicine	Remarks
Common Bacterial Infections in Poultry				
1. Colibacillosis	E. coli	Sulphamethoxazole & Trimethoprim (2g & 400 mg) **Chicks:** @ 2.5g/100 birds. (water consumption per day per chick is 80ml approximately which comes to 8 liters for 100 chicks therefore the dose rate is 2.5g in 8liters of drinking water or @25mg/bird or @25mg in 80ml of water. **Growers, Broilers**: @ 5g/100 birds. (water consumption approximately 160ml/bird/daily which comes 16 liters for 100 birds therefore	Tetracycline HCl @ 5gms/4.5 liters of drinking water for 5 days.	W.P. for Sulphamethoxazole & Trimethoprim: 6 days (meat); avoid using in eggs for human consumption. W.P. for Tetracycline Hcl: 5 days (meat).

		administer at the rate of 5g per 16 liters for 100 birds **Layers**: @10g/100 birds. Water consumption per layer per day is 210 ml therefore administer @ 10g in 21 liters of water for 100 layers for 5-7 days.		
2. Infectious synovitis	Mycoplasma synoviae	Tylosin + doxycycline powder @ 1g/1.5 liters of water for 3-5 days. OR TetracyclineHCL @5gms/4.5 liters of drinking water for 5 days	Erythromicin@2.5 mg/kg BW, IM for 5-7 days.	Tylosin & Doxycycline not to be used for chicken and eggs meant for human consumption. W.P. for Tetracycline HCL: as above (1) W.P. for Tylosin & Doxycyline: 7 days. W.P. for Erythromicin: 5 days (eggs)
3. Chronic respiratory disease(CRD)	Mycoplasma gallisepticum	Tylosin + doxycycline (dose as above, 2)	Enrofloxacin @ 50-100 mg/l drinking water For 3- 5 days.	Tylosin & Doxycycline not to be used for chicken and eggs meant for human consumption. Enrofloxacin should be used only after CST. W.P. for Tylosin & Doxycyline: 7 days

				W.P. for Enrofloxacin: 5 days in chicken and eggs
4. Fowl cholera	Pasteurella multocida	Sulphamethoxazole & Trimethoprim (2g & 400 mg) (dose as above, 1)	Enrofloxacin (dose as above, 3)	Potentiated sulfa causes hemorrhagic syndrome (interferes with vitamin K synthesis) W.P. for Sulphamethoxazole & Trimethoprim & Enrofloxacin: as above (1, 3)
5. Pullorum	Salmonella pullorum	Amoxycillin trihydrate @ 55-110mg/kg BW, PO every 24 hrs for 3-5 days	Amprolium+Sulfaquinoxaline powder For treatment-1g per litre of drinking water following 3-2-3 method i.e. 3 days of treated drinking water, 2 days of plain water and again 3 days of treated drinking water. For prevention, 1g per litre of drinking water for 3-4 consecutive days.	W.P. for amoxicillin: 4 days. W.P. for Sulphamethoxazole & Trimethoprim, Tetracycline HCl & Enrofloxacin: as above (1, 2, 3)
6. Fowl typhoid	Salmonella gallinarum	Sulphamethoxazole & Trimethoprim	Amprolium+Sulfaquinoxaline powder	W.P.

		(2g & 400 mg) (dose as above, 1)	(dose as above 5)	
7. Infectious coryza	Hemophilus paragallinarum	Tetracycline HCL(dose as above, 2)	Erythromicin (dose as above, 3)	W.P. for Tetracycline & Erythromicin: as above (2, 2)

21. Guidelines for aquaculture

Disease	Common causative agent	Recommended medicine	Alternative medicine	Remarks
1.Bacterial Haemorrhagic septicemia	Aeromonas hydrophila, Pseudomonas fluorescens	Oxytetracycline @ 50 mg/kg BW of fish with feeds for 10-14 days.		W.P. for Oxytetracycline: 21 days
2. Carp Erythrodermatitis	Aeromonas salmocida sub species nova	Terramycin @5-7g/100g feed daily for 7-10 days.		W.P. for Terramycin: 21 days
3. Columnaris	Flavobacterium columnare, Bacillus	Oxytetracycline @ 50-60 mg/kg of BW of fish with feed for 5-7 days.		W.P. for Oxytetracycline: (as above, 1)
4. Edwardsiellosis	E. ictaluri	Oxytetracycline (dose as above, 3)		W.P. for Oxytetracycline: (as above 1)
5. Epizootic Ulcerative Syndrome	Aphynomyces invadens	Erythromicin/ nalidixic acid/ Oxytetracycline @ 60-100 mg per kg feed for period of 7 days.		W.P. for Erythromicin: 25 days W.P. for Nalidixic Acid: 16 days W.P. for Oxytetracycline: (as above 1)

6. Eye Disease	Aeromonas liquefacians, staphylococcus aureus	Chloromphenicol @8-10mg/l bath for one hour for 2-3 days. NOT IN EVDL		W.P. for Chloramphenicol: 32 days
7. Furunculosis	Aeromonas salmonicida	Oxytetracycline (dose as above. 3)		W.P. for Oxytetracycline: (as above 1)
8. Gill disease	F. branchiophilum	Florphenicol @10mg/kg BW for 10days NOT IN EVDL		W.P. for Florphenicol: 15 days
9. Gill rot	Flexibacteria, Pseudomonas, Flavobacterium or Aeromonas	Oxyteracycline (dose as above. 3.)		W.P. for Oxytetracycline: (as above, 1)
10. Hemophilosis	Hemophilus piscium. Aeromonas hydrophila	Oxytetracycline @ 25-75 mg per kg BW of fish with feed for 35-45 days.		W.P. for Oxytetracycline: (as above, 1)
11. Pseudomonasis	Pseudomonas fluorescens, P. anguilliseptica	Oxytetracycline @ 55 mg/kg BW of fish with feed for 10-14 days.		W.P. for Oxytetracycline: (as above. 1)
11. Red pest(aquarium)	Cyprinicida	Tetracycline @10mg/lit of water		W.P for tetracycline: 8 days
12. Streptococcosis	Streptococcal spp	Erythromicin @ 1.5 grams of Erythromicin /1/2 Kg of feed, fed for 10 to 14 days.	Amoxicillin @ 80 mg/kg BW (= 3.6 grams/1/2 Kg of feed, fed for 8 to 12 days	W.P. for Erythromicin: (as above, 5) W.P. for Amoxycillin: 18 days

13. Tail and Fin rot	Aeromonas spp. Pseudomonas spp. Haemophilus spp	Tetracycline @50-60 mg/kg BW of fish with feed for 5-7 days.	Oxytetracycline @ 50 mg/kg BW of fish with feeds for 10-14 days.	W.P. for Oxytetracycline: (as above, 1)
14. Rainbow trout fly syndrome	F. psychrophilum	Florphenicol (dose as above, 8)		W.P for Florphenicol: 15 days
15. Vibriosis	Aliivibrio salmonicida	Oxytetracycline (dose as above, 13)	Erythromicin (dose as above, 12)	W.P. for Oxytetracycline: (as above, 1) W.P. for Erythromicin: (as above, 5)

22. Guidelines for Apiculture

Disease	**Common causative agent**	**Recommended medicine**	**Alternative medicine**	**Remarks**
American Foulbrood	Bacterium *Paenibacillus larvae*	Oxytetracycline with the powdered sugar mix (1:8 ratios by weight) along the margins of the brood chamber. Repeat 3 times at 4-5 day intervals in the spring and in the fall. (About 500g will provide enough antibiotic to treat 90 spring package	Tylosin tatrate 200 mg dose is applied (dusted) over the top bars of the brood chamber once weekly for 3 weeks. Colonies should receive 3 treatments administered as a dust in confectioners/ powdered sugar.	In order to prevent possible contamination of marketable honey, all Oxytetracycline treatments in spring or fall must occur outside the honey production season and should stop at least 4 WEEKS before the main honey flow. Honey or syrup stored in the colony during the antibiotic treatment period should not be used for human consumption!

		colonies or 45 wintered colonies.		To avoid violative residues in honey, **Tylosine** should be fed early in the spring or fall and consumed by the bees before the main honey flow begins. Complete treatments at least 4 weeks prior to main honey flow. Honey collected in supers before the end of the 4 week withdrawal period should not be harvested for human consumption.
European Foulbrood	*Melliscoccus pluton*	Oxytetracycline (dose as above)	Tylosin tatrate (dose as above)	Precaution as above

AFB & EFB PREVENTION & CONTROL.

- Antibiotics should NOT be used to cure American Foulbrood (AFB) or European Foulbrood (EFB) that is already present in a colony.
- Combs with visible signs of disease should be removed from the hive and either destroyed by fire or rendered. Furthermore, it is recommended that frames from infected hives, that are not showing signs of disease, be decontaminated or destroyed (burnt). Following removal of the diseased combs, start an antibiotic treatment.
- If honey is going to be harvested from the treated colony, antibiotic treatments for AFB & EFB should stop at least 4 WEEKS before the main honey flow.
- Honey or syrup stored in the colony during the antibiotic treatment period should not be used for human consumption.

W.P. for each antimicrobial have been used from available literatures and some of the products however, it depends upon the formulations of each manufacturer and hence, should refer the inserts for each drugs available at animal health facilities.

23. Antimicrobial guidelines for Animal feeds

No antibiotic should be used as growth promoters or feed additives. However, non-antibiotic antimicrobials like cocciodiostats could be added in the feeds as specified below in the table:

Sl. No	Coccidiostat/Drug	Use level (%) in feed	Withdrawal Time(Days)
1	Amprolium	0.0125-0.025	0
2	Monensin sodium	0.01-0.0121	0
3	Salinomycin sodium	0.0044-0.0066	0
4	Narasin	0.006-0.008	0

24. Definitions:

1. **Antibiotics:** An antibiotic is a substance produced by a microorganism that inhibits or kills other microorganisms.

2. **Antimicrobial:** Antimicrobial is any substance of natural, semi-synthetic or synthetic origin that kills or inhibits the growth of microorganisms but causes little or no damage to the host. Antimicrobials include all agents that act against all types of microorganisms – bacteria (antibacterial), viruses (antiviral), fungi (antifungal) and protozoa (antiprotozoal).

3. **Narrow Spectrum:** The antibiotic having limited action and the action is towards a particular organism.

4. **Board Spectrum:** The antibiotic is effective against both gram positive and negative organisms.

5. **Bacteriostatic:** The antibiotic which inhibits the growth and replication of the bacteria is called as bacteriostatic.

6. **Bactericidal:** The antibiotic which kills an organism is called bactericidal.

7. **Long acting antibiotics:** These are depository preparations such as procaine Penicillin, benzathine Penicillin or Oxytetracycline LA. They are used for longer duration of action and are always given Intramuscular. These preparations are then released slowly into the blood.

8. **Withdrawal Period:** Withdrawal periods is the time necessary for an animal to metabolize an administered medicine and the amount of time necessary for the medicine concentration level in the tissues to decrease to a safe, acceptable level.

9. **Off label Use:** Use of antimicrobials other than for intended use

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DoL
Fighting Antibiotic Resistance
HANDLE ANTIBIOTICS WITH CARE
Antibiotics are essential resources for human health, animal health and animal welfare. Their misuse can result in the emergence of bacteria resistant to their action, also called antibioresistant. This phenomenon deeply threatens the control of diseases worldwide.
We need to collectively ensure the responsible and prudent use of antibiotics in animals to preserve their effectiveness.
WHAT CAN YOU DO AS
Veterinarians or Animal health workers
1
2
3
4
5
Only prescribe and dispense antibiotics for animals under your care and only if necessary
Conduct antimicrobial sensitivity testing before prescribing or administering an antibiotic
Educate animal owners on the risks associated with inappropriate use of antibiotics
Implement hygiene methods, vaccination strategies, and periodically review farm records to ensure compliance with your prescriptions
Keep your knowledge on antibiotic use recommendations up to date
World Organisation for Animal Health
World Health Organization

Fighting Antibiotic Resistance

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We need to collectively ensure the responsible and prudent use of antibiotics in animals to preserve their effectiveness.

WHAT CAN YOU DO AS Farmers

1. Only use antibiotics when prescribed or administered by a veterinarian or animal health worker.
2. Follow the recommended dosage and length of treatment even if your animal seems to have recovered.
3. Exclusively buy antibiotics from authorized sources.
4. Maintain safe and hygienic good hygiene and husbandry practices to prevent infections.
5. Keep adequate written records of all antibiotics used as well as the laboratory results.

OIE WORLD ORGANISATION FOR ANIMAL HEALTH

World Health Organization