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Antibiotic usage in veterinary practice: Do's and don't's

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Abstract

Antibiotics are vital drugs in veterinary medicine and cannot be replaced in the time ahead due to the paucity of appropriate replacements. All antibiotics used in veterinary medicine are the same or closely related to antibacterials used in human medicine and may instigate cross-resistance. Judicious use of antibiotics must be propagated with great care by veterinarians across the world to safeguard both human and animal health collectively with one health approach. The selection of the optimal antibiotic should be based on considering certain factors determining their efficacy like bacterial sensitivity, penetration into infected tissues, pharmacokinetics, pharmacodynamics, route of administration and treatment duration. This review aims to describe the salient principles for rationale use of antibiotics in veterinary practice.

Keywords: Antibiotic, veterinary practice

Introduction

Antibiotics also known as antibacterials are substances produced by a microorganisms that are capable, in low concentrations, of inhibiting the growth of or killing other microorganisms. Antibiotics are widely used in veterinary medicine for therapeutic as well as prophylactic therapy of bacterial infectious diseases in animals. The main classes of antibiotics in current use includes beta-lactams, fluoroquinolones, tetracyclines, aminoglycosides and macrolides. Antibiotics are vital drugs in veterinary medicine and cannot be replaced in the time ahead due to the paucity of appropriate replacements.

The new WHO recommendations focuses to help safeguard the effectiveness of antibiotics that are important for human medicine by minimizing their unwanted use in animals particularly food producing animals. Over-use and misuse of antibiotics in animals and humans are contributing to the rising threat of antibiotic resistance ^[1]. All antibiotics used in veterinary medicine are the same or closely related to antibacterials used in human medicine or may instigate cross-resistance ^[2]. A growing number of infections are becoming difficult to treat as the antibiotics become less effective. Antibiotic resistance leads to longer hospital stays, higher medical costs and increased mortality. Thus, antibiotic misuse in animals hurts human health. Judicious use of antibiotics must be propagated with great care by veterinarians across the world to safeguard both human and animal health collectively with one health approach ^[4].

Principles for rationale use of antibiotics

The main criteria before initiation of antibiotic treatment should be the valid presence or suspicion of a bacterial infection. Moreover, other infection like viral, parasitic or fungal should be ruled out for which antibiotic therapy will not respond. Considering the history as well as signalment when making a diagnosis of bacterial infection has significant importance. Identifying the likely pathogen and using the narrow-spectrum antibiotic available is regarded as ideal treatment modality ^[3].

Usually the first choice of an antibiotic is done empirically ^[4]. When an infection is complicated or during life-threatening circumstances, antibiotic treatment is usually initiated before results from culture and sensitivity testing are obtained. Monitor response to treatment to ensure satisfactory acceptable outcome. If there occurs any treatment failure, perform more investigation before changing or combining antibiotics. When treating a bacterial infection, the option of antibiotic should be based on an anticipation of clinical efficacy, toxicity and drug resistance ^[3].

The selection of the optimal antibiotic should be based on considering certain factors determining their efficacy like bacterial sensitivity, penetration to infected tissues, pharmacokinetics, pharmacodynamics, route of administration and duration of treatment. Also, there is need to look on other elements like risk of toxicity or resistance, as well as the cost.

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Proper antimicrobial use defines good therapeutic efficacy, enhances treatment success, and minimizes resistance to antimicrobials [5]. Studies have reported the presence of antibiotic-resistant bacterial strains in companion animals [6] namely methicillin-resistant staphylococcus aureus (MRSA) can be transferred between veterinarians / owners and pets and also between owners and their pets. A superior understanding of the common bacterial infections in different organ systems helps to undertake a successful empirical antibiotic therapy. Diagnostic cytology should be done for appropriate choice of antibiotic. The veterinarian must focus on classic bacterial sensitivities as well as antibiotic resistance to specific antibiotics [7]. Certain bacterial organisms like Pasteurella and Streptococcus have sensitivities for narrow spectrum penicillins. While tetracyclines are ideal for intracellular pathogens, the anaerobes are seen more sensitive to penicillin and clindamycin [9]. Regular sampling for culture and sensitivity testing shall be followed for better clinical efficacy of antibiotics [8].

Adequate perfusion of tissues results in better reach of drug concentration. A less number of lipophilic antibiotics are able to penetrate barriers in CNS, eyes, prostate, bronchi. Certain local factors like the presence of pus or necrotic tissue, can reduce the efficacy of antibiotic. Selection of antibiotics shall also be based on whether they are concentration-dependent (uroquinolones and aminoglycosides), time-dependent as (penicillins and cephalosporins) or both (clindamycin).

Side effects should be considered while selecting appropriate antibiotic for the animals. Cartilage damage in growing animals are seen with the use of fluoroquinolones. Patients with renal disease as well as hypovolaemia should not be administered aminoglycosides. Certain cephalosporins can give false positive reactions for glucose in urine. Bone marrow suppression / aplastic anaemia is seen with chloramphenicol usage and specifically dogs are at higher risk than cats. Owners should use gloves to apply chloramphenicol as aplastic anaemia can be induced in humans following contact.

If treated longer, sulphonamides can induce macrocytic anaemia in cats and kerato-conjunctivitis sicca in dogs. With tetracyclines, occurrence of renal tubular disease, cholestasis is reported. Fever, oesophagitis and stricture development in cats after oral dosing with doxycycline are observed. Neutropenia has been reported to occur with metronidazole. Beta-lactam antibiotics have the least severe side effects in total. [10].

Specific indications - Do's And Dont's

Its important to make a diagnosis before prescribing antibiotics to animals with skin ailments. Whenever possible, topical antimicrobials and medicated shampoos should be used instead of systemic antimicrobials in dermatological disorders. In the case of urinary tract diseases, confirm with quantitative cultures. Free catch urine samples must be avoided for diagnosis of urinary infection. Routine dental procedures in healthy animals should avoid usage of antibiotics. For healthy animals with gastrointestinal disease like diarrhoea, avoid use of antibiotics. Supportive therapy like fluid replacement, change in diet can be looked into for better outcomes [8].

In case of uncomplicated upper respiratory tract disease, avoid use of antimicrobials Also, refrain from antimicrobial use in healthy dogs and cats before breeding. Diseases like simple juvenile vaginitis does not require antibiotics. Avoid

prophylactic antimicrobials for routine surgeries and if used, do not administer them beyond the perioperative period.

Conclusions

Over-use and misuse of antibiotics in animals and humans are contributing to the rising threat of antibiotic resistance. Hence, responsibility of judicious use of antibiotics in animals lies with veterinarian. Regular sampling for culture and sensitivity testing shall be followed for better clinical efficacy of antibiotics along with other salient factors.

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