



Bacterial Infection and Antimicrobial Resistance in Dogs and Cats: A Mini Review

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Abstract

Dog and cats are well known for their role in the transmission of infections worldwide. It is important to observe that many diseases possess major problem of health in Dogs and cats worldwide. This review aims to summarize the current knowledge on the use and indications for antimicrobials to treat sick dogs and cats, drug-resistant bacteria of concern among companion animals, and transmission of antimicrobial resistance between animals and humans. The bacterial strains that cause antimicrobial resistance (AMR) in dogs and cats have not gotten as much attention as antimicrobial resistance in livestock. Bacterial infections resulting from dog and cat bites are not common, as their oral cavities harbor a substantial abundance of microbial taxa. However, there is growing concern in both veterinary and public health circles over the emergence of AMR in cats and dogs, particularly in relation to infections like methicillin-resistant *Staphylococcus aureus* (MRSA), multidrug-resistant *E. coli* (MDR), and *Klebsiella pneumoniae*.

Keywords: Bacteria, Antimicrobial resistance, Dog, Cat

Introduction

Opportunistic infections caused by bacteria such as, *Bordetella bronchiseptica*, *Pasteurella multocida*, *Staphylococci*, *Pseudomonas Streptococci* and coliform bacteria can lead to various disease conditions in dogs (Ayodhya *et al.*, 2013). *Staphylococcal* infections are quite common, and these bacteria are typically found on the mucous membranes and skin of both animals and humans. They can be distinguished by their ability to produce coagulase, with coagulase-positive strains being more pathogenic than coagulase-negative ones (Gilot-Fromont *et al.*, 2012). Cutaneous wounds are defined as breaks or disruptions in the skin's cellular and anatomical integrity. According to Cantatore *et al.*, (2013), a number of incidents, such as bites, vehicle collisions, abrasions from sharp objects, gunshot wounds, injuries from sticks, burns, and tumor excisions, can cause cutaneous wounds in small animals. Large-scale traumatic injuries are frequently present in these wounds, which can result in a large amount of infection, devitalized tissue or contamination. They can also result from problems with wound healing or by undue stress on the margins of wounds following invasive soft tissue procedures involving the skin layers (Prpich *et al.*, 2014).

An opportunistic infection, *Staphylococcus canis* usually inhabits the vaginal and anal mucosa of dogs. Numerous illnesses have been linked to it, such as otitis externa, septicemia, necrotizing fasciitis, urogenital, skin infections and respiratory tract

infections, and streptococcal toxic shock syndrome (Sharma *et al.*, 2012). Feral cats are free-ranging animals that have no dependency on people and are frequently found in unaltered environments. Stray cats, on the other hand, are free-ranging animals that have no clear ownership but may occasionally or somewhat depend on humans Australian Veterinary Association (AVA) 2022.

Sharma *et al.*, (2012) observed fourteen instances of necrotizing fasciitis (NF) and canine Streptococcal toxic shock syndrome (STSS) were collected in 1992 from Ontario, Canada. These canines had the classic symptoms of STSS, and one of them also had spinal cord involvement. Eight of the 14 incidents included dogs with NF. All NF patients had intense pain as a defining sign, and within 48 hours of presentation, localized heat and edema were seen. Extensive exudate buildup was also seen along the fascial planes in dogs with NF (Sasaki *et al.*, 2007). Additionally, cats are known to harbor up to 50 zoonosis worldwide (Woinarski *et al.*, 2019) and can transmit a wide range of dangerous infections (Loss & Marra 2017; Legge *et al.* 2020a). According to the research done in a Japanese veterinary teaching hospital, *Staphylococcus pseudintermedius* was detected in 46.2% of inpatient dogs and 19.4% of outpatient dogs (Sasaki *et al.*, 2007). In both urban and rural regions, the prevalence of *S. aureus* and *S. pseudintermedius* in dogs has been reported. According to the study, *S. aureus* was found to be 20.7% prevalent in rural regions and 43.8% prevalent in urban areas. According to Gomez *et al.*

(2013), the prevalence of *S. pseudintermedius* was 22% in rural regions and 25% in urban areas. Furthermore, methicillin-resistant *Staphylococcus schleiferi* (MRSP) isolation from dogs has been reported in Canada, where it has a 0.5% frequency (Hanselman et al., 2009).

Nevertheless, *S. pseudintermedius* was shown to be more common than previously thought by Rubin and Chirino-Trejo (2011), who found that 88.6% of 167 sampled dogs and 87.4% of 175 dogs tested positive for it. Onuma et al. (2012), however, found that dogs with pyoderma infection had a greater incidence of *S. pseudintermedius*, with figures of 76.1% in 1999–2000 and 76.4% in 2009. Hanselman et al. (2008) observed low prevalence of methicillin-resistant *Staphylococcus schleiferi* (MRSS) (0.5%) and MRSP (2.1%) in Canada. The lentivirus known as the feline immunodeficiency virus (FIV) causes a disease in cats that is comparable to the acquired immunodeficiency syndrome (AIDS) in humans (Norris et al., 2010; Elder, 2010).

Antimicrobial use in cats and dogs: Spending on veterinary concern and the prevention and treatment of infectious illnesses has grown because of the present emphasis on small animal welfare. As a result, antimicrobial drugs are more often used in companion animals, especially in the field of veterinary care. According to Watson et al. (2000), this covers the use of substances essential for treating infections in humans as well as antimicrobial drugs that have been licensed for use in humans. Including parasiticides and medicated feed additives, anti-infective products accounted for 17% of animal pharmaceutical sales in 2002, with pharmaceuticals for pets and other non-food animals comprising 36.5% of animal health sales in the European Union International Federation for Animal Health (IFAH), 2003. Colleagues in small animal practice typically have a stronger financial base to fund laboratory testing and antimicrobial treatment than do veterinarians dealing with larger animals. However, in some difficult instances, when diagnostic ambiguity, worries about subsequent infections, empirical antibiotic selection, and owner pressure might lead to improper antimicrobial usage, this condition can occasionally result in less rigorous antimicrobial prescribing policies. Certain diseases in dogs, such as pyoderma and other forms of otitis externa, can need long-term, recurring care. Cefalexin is the usual treatment for *S. intermedius* caused recurrent pyoderma; intermittent or continuous low-dose therapy is also sometimes employed (Meneses et al., 2018). Fluoroquinolones are commonly used to treat cases, and prolonged medication for up to seven months may be necessary (Azzariti et al., 2022). Fusidic acid is frequently used topically in dogs with eye and skin infections. For skin infections, mupirocin is an appropriate substitute for fusidic acid. Topical therapy for canine otitis media is frequently administered with aminoglycosides such as neomycin and gentamycin. Topical and/or systemic

fluoroquinolones or ticarcillin are commonly used to treat chronic otitis externa, which typically involves multi-resistant *Pseudomonas aeruginosa* (Martin et al., 2000; Petersen et al., 2002).

One major obstacle to treating bacterial infections in veterinary medicine is antimicrobial resistance. Antimicrobials can cause bacterial species to become resistant over time, despite their variable sensitivity. Among the greatest discoveries of humankind in the 20th century was the discovery of antibiotics. The introduction of novel antibiotic-resistant bacterial strains may be facilitated by the administration of drugs without first determining the precise bacterial species being treated and without first performing antimicrobial sensitivity tests (Rehman et al., 2015). Many variables are considered that affect bacteria's susceptibility to antibiotics, and continuous antimicrobial testing is essential for tracking bacteria's response to antibiotics (Li et al., 2017). It is critical to correctly diagnose bacterial infections in dogs and to provide the right kind of management to avoid serious effects (Sykes & Weese 2013).

Conclusions

Infections in dogs and cats exhibit a polymicrobial nature, and therefore, for the successful treatment of persistent infections, it is essential to consider proper microbial diagnosis and acknowledge the presence of microorganisms when determining effective antimicrobial treatments. Public awareness needs to be raised regarding the significance of infections resulting from bites by dogs and cats. This awareness should encompass the potential public health implications associated with such incidents.

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