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ANTIBIOTIC RESISTANCE PATTERNS IN BACTERIAL INFECTIONS AMONG DOMESTIC ANIMALS

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ABSTRACT

Antibiotic resistance has become a major challenge in veterinary medicine and animal healthcare, affecting the successful treatment of bacterial infections among domestic animals. The increasing and sometimes inappropriate use of antibiotics in veterinary practices, livestock production, and animal healthcare has contributed to the development and spread of antimicrobial-resistant bacteria. Domestic animals, including cattle, sheep, goats, dogs, and cats, may carry resistant bacterial pathogens that can cause serious infections and create potential public health risks. This research examines antibiotic resistance patterns in bacterial infections among domestic animals, focusing on commonly identified bacterial pathogens, frequently used antibiotics, resistance mechanisms, and factors contributing to antimicrobial resistance. The study also explores the importance of laboratory-based bacterial identification, antimicrobial susceptibility testing, responsible antibiotic administration, and improved veterinary healthcare practices. A descriptive research approach is proposed to examine existing scientific literature and veterinary laboratory findings related to antibiotic resistance. The study emphasizes the importance of antimicrobial stewardship, regular disease monitoring, veterinary supervision, and public awareness. Understanding antibiotic resistance patterns can support effective treatment decisions, reduce unnecessary antibiotic use, improve animal welfare, and contribute to the protection of public health through a One Health approach.

KEYWORDS.*Antibiotic Resistance, Domestic Animals, Bacterial Infections, Antimicrobial Susceptibility, Veterinary Medicine, Resistant Bacteria, Animal Health, One Health, Antibiotic Usage, Disease Management.*

INTRODUCTION

Antibiotic resistance is one of the most significant challenges facing modern veterinary medicine and global public health. Antibiotics are widely used to prevent and treat bacterial infections in domestic animals, including cattle, buffaloes, sheep, goats, dogs, and cats. These medicines play an important role in controlling infectious diseases, improving animal health, maintaining livestock productivity, and protecting animal welfare. However, the inappropriate and excessive use of antibiotics has contributed to the emergence of resistant bacterial strains that are increasingly difficult to treat. When bacteria develop resistance to commonly prescribed antibiotics, standard veterinary treatments may become ineffective, resulting in prolonged infections, increased treatment expenses, higher mortality risks, and reduced animal productivity. Antimicrobial resistance is therefore not only an individual animal healthcare problem but also a broader concern involving veterinary professionals, livestock farmers, food safety authorities, and public health organizations. Ali, S., Tariq, M. H. A., Choudry, M. Y. K. B., Ahmed, M.,

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Haq, M. U., & Zahra, R. (2025).founds thatDomestic animals are exposed to various bacterial infections that may affect their respiratory systems, digestive systems, urinary tracts, skin, reproductive organs, and other body tissues. Common bacterial pathogens include Escherichia coli, Staphylococcus aureus, Salmonella species, Streptococcus species, and Pasteurella species. These organisms can cause different infections depending on the animal species, environmental conditions, age, immune status, and management practices. Antibiotics such as penicillins, tetracyclines, aminoglycosides, fluoroquinolones, and cephalosporins are frequently used in veterinary treatment. Nevertheless, resistance to several antimicrobial groups has been reported in bacterial isolates obtained from domestic animals. Such resistance can limit treatment options and create difficulties for veterinarians attempting to manage recurring or severe infections. The identification of bacterial pathogens and the examination of their antibiotic susceptibility are therefore essential components of effective veterinary healthcare.

The development of antibiotic resistance is influenced by several factors, including inappropriate prescriptions, incorrect dosages, unnecessary treatment, incomplete treatment courses, poor infection-control practices, and the use of antibiotics without proper laboratory diagnosis. In some livestock production systems, antibiotics may also be administered without sufficient veterinary supervision. These practices create conditions that encourage resistant bacteria to survive, multiply, and spread among animals. Resistant microorganisms and resistance genes may circulate through direct animal contact, contaminated environments, animal-derived food products, and interactions between animals and humans. Consequently, antibiotic resistance in domestic animals has important implications beyond veterinary clinics and farms. It requires +coordinated axplainedttention from veterinary professionals, farmers, microbiologists, researchers, and public health institutions. Bugarim, T., Bachmann, V. M., Corrente, M., Sasso, R., Madio, A., Dibari, M., ... & Greco, G. (2026).explain thatThe One Health approach provides an important framework for understanding the relationship between animal health, human health, and environmental conditions. Domestic animals can act as carriers of resistant bacteria, while contaminated water, soil, animal waste, and food-production environments may contribute to the transmission of antimicrobial-resistant microorganisms. Understanding these connections is particularly important in countries where veterinary diagnostic facilities, antibiotic regulations, and awareness of responsible antimicrobial use may vary between regions. Regular monitoring of bacterial infections and antibiotic susceptibility patterns can help identify emerging resistance problems and guide appropriate treatment decisions. This research therefore focuses on antibiotic resistance patterns in bacterial infections among domestic animals, emphasizing bacterial identification, antimicrobial susceptibility, contributing factors, veterinary treatment practices, and preventive strategies.

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RESEARCH OBJECTIVES

1. .To evaluate veterinary practices and preventive strategies for controlling antibiotic resistance.

RESEARCH QUESTIONS

1. Which bacterial pathogens are commonly responsible for infections among domestic animals?

LITERATURE REVIEW

Antimicrobial resistance has received considerable attention in veterinary research because resistant bacterial infections can reduce the effectiveness of commonly used veterinary medicines. Previous studies have demonstrated that bacterial pathogens isolated from domestic animals may show different levels of susceptibility and resistance to commonly prescribed antibiotics. Escherichia coli is frequently investigated because it is associated with intestinal, urinary, and systemic infections in animals and can carry resistance determinants. Similarly, Staphylococcus aureus is an important veterinary pathogen associated with skin, wound, and udder infections. Other bacterial organisms, including Salmonella species, Enterococcus species, and Pasteurella multocida, are also relevant to antimicrobial resistance investigations. The increasing occurrence of resistant bacterial isolates highlights the importance of identifying pathogens before selecting appropriate antimicrobial treatments. Laboratory-based investigations provide valuable information about bacterial susceptibility and help veterinarians understand which antibiotics may remain effective against particular infections. Maeda, A., Sato, T., Toyting-Hiraishi, J., Suzuki, A., Hoshino, Y., Torigoe, S., ... & Horiuchi, M. (2025).Research on antibiotic resistance in livestock has identified important concerns regarding the relationship between antimicrobial use and the development of resistant microorganisms. Antibiotics are frequently used in the treatment of respiratory infections, gastrointestinal diseases, reproductive infections, and other bacterial conditions affecting farm animals. However, repeated exposure to antimicrobial agents can create selective pressure that allows resistant bacteria to survive and multiply.

The researchers collected 1,017 nasal swabs and examined bacterial isolates through microbiological and molecular techniques. Their research demonstrates the importance of combining bacterial identification, susceptibility testing, and resistance-gene investigation to understand veterinary antimicrobial resistance (Ali et al., 2025). Antibiotic resistance is also an important concern among companion animals, particularly dogs and cats that maintain close relationships with human beings. These animals may experience repeated veterinary visits,

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antibiotic treatments, surgical procedures, and hospital exposure, creating opportunities for the selection and transmission of resistant microorganisms. Caddey et al. (2025) examined the transmission of common antimicrobial-resistant organisms between people and companion animals, including dogs, cats, and horses. Their review emphasizes the importance of understanding the shared human-animal environment and the potential movement of resistant organisms between different populations. Such findings support the need for improved infection prevention, appropriate veterinary prescriptions, hygiene practices, and responsible antimicrobial administration in households and veterinary hospitals. Government of Pakistan, Ministry of National Health Services, Regulations and Coordination. (2024). Recent veterinary surveillance research has also highlighted the importance of studying antimicrobial resistance across different bacterial species and animal populations. Bugarim et al. (2026) examined veterinary laboratory antibiogram reports from domestic animals in Southern Italy covering the period from 2020 to 2025. Their investigation included 228 reports and 2,599 individual antimicrobial susceptibility tests. Staphylococcus species and E. coli were among the most frequently isolated bacteria. The study demonstrates how historical laboratory records can be used to identify resistance patterns and support evidence-based veterinary treatment decisions.

It also emphasizes the importance of maintaining regular surveillance systems that include both companion animals and livestock. Goetschel, A. F. (2024).The Food and Agriculture Organization has emphasized that monitoring antimicrobial use at farm level is essential for understanding and controlling antimicrobial resistance in food-producing animals. Farm-level monitoring can help identify the types of antibiotics being administered, the frequency of their use, and the management practices associated with antimicrobial exposure. FAO guidelines developed in collaboration with the World Organisation for Animal Health provide recommendations for establishing monitoring systems and improving antimicrobial-use records. These approaches are particularly important in livestock production because responsible antibiotic use, proper animal management, and improved disease prevention can reduce unnecessary antimicrobial exposure (FAO et al., 2023). The World Organisation for Animal Health recommends responsible and prudent antimicrobial use as a central component of veterinary disease management. Its guidelines emphasize that veterinarians should consider clinical examination, appropriate bacterial diagnosis, laboratory findings, and antimicrobial susceptibility results before selecting treatment. The organization also highlights the importance of vaccination, biosecurity, hygiene, appropriate animal nutrition, and good husbandry practices. These measures can reduce the occurrence of infectious diseases and decrease unnecessary dependence on antibiotics. The existing literature therefore suggests that controlling antimicrobial resistance requires a combined approach involving scientific investigation, responsible veterinary treatment, improved animal management, and continuous monitoring (WOAH, 2024).

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METHODOLOGY

This research adopts a descriptive and literature-based methodology to examine antibiotic resistance patterns in bacterial infections among domestic animals. The methodological approach focuses on collecting, reviewing, and analyzing relevant scientific information concerning bacterial pathogens, antimicrobial susceptibility, resistance mechanisms, veterinary antibiotic usage, and animal healthcare practices. Published research articles, veterinary microbiology studies, scientific reviews, institutional reports, and relevant international guidelines are considered important sources of information. Particular attention is given to studies involving cattle, buffaloes, sheep, goats, dogs, and cats because these animals represent important populations in domestic animal healthcare. Research published in recent years is prioritized to provide a contemporary understanding of antimicrobial resistance and its implications for veterinary medicine.The study focuses on commonly reported bacterial pathogens, including Escherichia coli, Staphylococcus aureus, Salmonella species, Enterococcus species, Pasteurella multocida, and other clinically relevant bacteria. Information concerning the sources of bacterial isolates, animal species, infection types, laboratory identification techniques, and antimicrobial susceptibility findings is examined. Particular attention is given to commonly used antimicrobial groups, including penicillins, tetracyclines, cephalosporins, aminoglycosides, and fluoroquinolones. The purpose is to understand how resistance varies between bacterial organisms and antimicrobial categories rather than assuming that all bacteria respond similarly to a particular antibiotic.Relevant literature is selected according to its relationship with veterinary antimicrobial resistance, domestic animal infections, bacterial identification, and antibiotic susceptibility testing.

RESEARCH DESIGN

The research design is based on a descriptive, comparative, and analytical framework for investigating antibiotic resistance among bacterial pathogens associated with domestic animals. The design provides a systematic structure for examining existing evidence and understanding the relationship between bacterial infections, antimicrobial exposure, and resistance development. It focuses on both food-producing animals and companion animals to provide a broader understanding of veterinary antimicrobial resistance. The inclusion of different animal populations is important because bacterial infections, treatment practices, and exposure to antibiotics may differ according to species, healthcare requirements, and environmental conditions.The first component of the research design involves identifying the major bacterial pathogens associated with domestic animal infections. Scientific literature is examined to determine which organisms are frequently reported in veterinary diagnostic investigations. Bacterial pathogens are classified according to their characteristics and commonly associated

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infections. For example, E. coli is examined in relation to intestinal and urinary infections, while S. aureus is considered in relation to skin, wound, and mammary gland infections. Other organisms are also reviewed according to their veterinary importance and available scientific evidence.The second component focuses on antimicrobial susceptibility patterns. Existing laboratory findings are compared to understand the reported susceptibility and resistance of bacterial isolates against different antibiotic groups. Particular attention is given to the variation in resistance between bacterial species and animal populations. This comparison helps identify antimicrobial agents for which resistance has been frequently reported and highlights the importance of avoiding treatment decisions based solely on assumptions or previous prescriptions. The interpretation of susceptibility results should follow appropriate laboratory standards and organism-specific clinical breakpoints.The third component examines the factors associated with antibiotic resistance development.

DATA ANALYSIS

Data analysis is conducted through descriptive and comparative examination of information obtained from published veterinary studies and scientific reports. The collected information is organized into categories according to animal species, bacterial pathogens, infection types, antimicrobial agents, and geographical locations. This classification makes it possible to identify similarities and differences in reported antibiotic resistance patterns. The analysis emphasizes the relationship between bacterial characteristics and antimicrobial susceptibility rather than treating all bacterial infections as a single category. It also considers differences in sampling methods, laboratory techniques, and study populations because these factors may influence reported resistance levels.Antimicrobial susceptibility findings are interpreted by examining the proportion of bacterial isolates classified as susceptible, intermediate, or resistant according to the standards used in the original studies. When numerical data are available, resistance percentages can be calculated using the following formula:\[\text{Resistance Percentage}= \frac{\text{Number of Resistant Isolates}} {\text{Total Isolates Tested}}\times100 \]For example, if 40 out of 100 bacterial isolates demonstrate resistance to a particular antibiotic, the resistance percentage would be 40%. Such calculations help summarize laboratory observations and allow comparisons between different antimicrobial agents. However, comparisons should be made carefully because different studies may use different bacterial populations, sample types, testing standards, and antibiotic panels.The analysis also considers multidrug resistance, which generally refers to bacterial isolates showing acquired non-susceptibility to at least one agent in three or more antimicrobial categories.

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FINDINGS

The reviewed literature indicates that antibiotic resistance is an important concern among bacterial pathogens associated with domestic animal infections. Organisms such as Escherichia coli, Staphylococcus aureus, Salmonella species, Enterococcus species, and Pasteurella multocida are frequently included in veterinary antimicrobial resistance investigations. Their presence in different animal populations demonstrates the importance of regular bacterial identification and laboratory-based susceptibility testing. The findings also suggest that resistance patterns are not identical across all bacterial species, meaning that the selection of antibiotics should be based on the specific organism, infection characteristics, and available laboratory evidence.A second important finding concerns the variation in antimicrobial resistance among different animal populations and geographical regions. Livestock animals may experience different patterns of antibiotic exposure compared with companion animals because of differences in production systems, veterinary management, and healthcare requirements. Similarly, dogs and cats may be exposed to antimicrobial treatments through repeated veterinary visits and close human-animal contact. Published studies demonstrate that resistance surveillance should include both livestock and companion animals rather than focusing exclusively on food-producing species. Such monitoring can improve understanding of resistant bacteria across the wider domestic animal population.The reviewed evidence also highlights inappropriate antibiotic use as an important factor contributing to resistance development. Unnecessary treatment, self-medication by animal owners, incorrect dosage, and inadequate veterinary supervision can increase the risk of antimicrobial resistance. Limited diagnostic facilities may also encourage empirical treatment without sufficient information about the bacterial cause of infection.

CONCLUSION

Antibiotic resistance among bacterial infections in domestic animals represents a serious challenge for veterinary healthcare, animal welfare, and public health. The increasing occurrence of resistant bacterial pathogens can reduce the effectiveness of commonly used antibiotics and make the treatment of infectious diseases more difficult. Bacteria such as Escherichia coli, Staphylococcus aureus, Salmonella species, Enterococcus species, and Pasteurella multocida demonstrate the importance of continuous investigation into antimicrobial susceptibility patterns. Understanding these organisms and their resistance characteristics is essential for developing effective veterinary treatment strategies and improving animal health outcomes.The research highlights that inappropriate antibiotic use, insufficient laboratory diagnosis, weak infection-control practices, and inadequate veterinary supervision can contribute to the development and spread of antimicrobial resistance. Responsible antibiotic administration should therefore become an essential component of domestic animal healthcare. Veterinarians should prioritize

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accurate diagnosis, appropriate prescriptions, and antimicrobial susceptibility testing whenever clinically indicated. Animal owners and livestock farmers should avoid unnecessary medication and follow professional veterinary guidance.The study also emphasizes the importance of regular surveillance and improved veterinary laboratory facilities. Systematic collection of bacterial samples, accurate pathogen identification, and standardized antimicrobial susceptibility testing can provide useful information about emerging resistance patterns. Such information can help veterinary professionals make evidence-based treatment decisions and support the development of effective antimicrobial stewardship programs. Greater research attention should also be given to regional differences, resistance genes, multidrug-resistant organisms, and antibiotic-use practices among different animal populations.

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