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Antimicrobial resistance in veterinary medicine from the perspective of the one health approach

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ABSTRACT

Antimicrobial resistance (AMR) is a growing challenge in global health, driven by the inappropriate use of antibiotics in veterinary medicine, especially in intensive production systems. Production and companion animals can act as reservoirs of resistant bacteria, favoring transmission to humans and the environment. The One Health approach integrates human, animal, and environmental health, highlighting the need for continuous surveillance, effective public policies, and the rational use of antimicrobials. Measures such as biosecurity, professional education, and therapeutic alternatives are essential to mitigate AMR and preserve the effectiveness of treatments.

Keywords: Health Education. Public Health. Antibiotic Resistance.

1 INTRODUCTION

Antimicrobial resistance (AMR) is one of the greatest global public health challenges of the 21st century. It is estimated that by 2050, infections caused by multidrug-resistant microorganisms may lead to as many as 10 million deaths annually, surpassing cancer as the leading cause of mortality (Repik, 2022). In veterinary medicine, antimicrobials are essential for the treatment and prevention of infectious diseases in food-producing animals, as well as for surgical prophylaxis and postoperative care. However, inappropriate use whether due to incorrect dosing, absence of microbiological diagnosis, or the administration of antibiotics as growth promoters—accelerates the selection of resistant strains (Kohl; Pontarolo; Pedrassani, 2016). AMR is a significant issue that transcends species and ecosystem boundaries. Moreover, there is a high potential for the transmission of resistance genes among pathogenic and commensal bacteria, which can contaminate the environment through waste, effluents, and contaminated animal-derived products (Almeida *et al.,* 2023). Therefore, animal, human, and environmental health are interconnected, justifying the

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application of the One Health concept an integrated approach that seeks to understand and mitigate risks across all levels of the ecosystem (Walsh, 2018). In Brazil, intensive food production systems and the easy access to veterinary antimicrobials without prescription worsen this scenario (Silva *et al.,* 2025). Thus, understanding the role of veterinary medicine in the dynamics of antimicrobial resistance is essential for the development of effective and sustainable policies that ensure collective health.

2 OBJECTIVE

To analyze antimicrobial resistance in veterinary medicine from the perspective of the One Health approach, highlighting the relationships between antimicrobial use in animals, the dissemination of resistant microorganisms, and the impacts on human and environmental health.

3 METHODOLOGY

This study is a literature review based on articles published in the last ten years, retrieved from PubMed, SciELO, and Google Scholar. Publications in English and Portuguese addressing antimicrobial use in veterinary medicine and epidemiological surveillance were selected. The following descriptors were used: “antimicrobial resistance,” “veterinary medicine,” and “antimicrobial resistance and One Health.” Studies that lacked relevance to the proposed objective were excluded.

4 DEVELOPMENT

4.1 USE OF ANTIMICROBIALS IN ANIMALS

The use of antibiotics in food-producing animals can provide important benefits; however, it is widely criticized due to its frequent inappropriate application. Many producers use antimicrobials prophylactically or as growth promoters practices that may appear advantageous but significantly increase the emergence of resistant strains. These strains can reach humans through the food chain (Repik *et al.,* 2022).

4.2 TRANSMISSION AND RESERVOIRS

Antimicrobials are used extensively for the prevention and treatment of infections; however, their use is often unnecessary or carried out incorrectly. In this context, companion animals may act as reservoirs of resistant bacteria, representing a potential public health risk.

Additionally, the environment becomes an important link in the dissemination of resistance genes, particularly due to the improper disposal of pharmaceuticals and animal waste (Kohl; Pontarolo; Pedrassani, 2016).

4.3 SURVEILLANCE AND PUBLIC POLICIES

Continuous surveillance of antimicrobial resistance is essential for guiding public policies and control actions. Well-structured monitoring systems allow for the rapid identification of changes in resistance patterns. However, incorporating new technologies and diagnostic tools still faces challenges, such as limited resources, the need for professional training, and operational barriers within health services (Mendes *et al.,* 2024). In Brazil, the National Health Surveillance Agency (ANVISA) and the Ministry of Agriculture and Livestock (MAPA) have developed action plans aligned with the One Health approach.

4.4 MITIGATION STRATEGIES

Preventive measures such as rational antimicrobial use, vaccination, improved biosafety practices, and the development of alternative therapies are essential. In this sense, it is crucial for strategic sectors, including public health, to implement effective and integrated methods to combat AMR (Mendes *et al.,* 2024). Continuing education for veterinarians and producers is considered one of the most effective control strategies (Silva *et al.,* 2025).

4.5 THE ONE HEALTH PERSPECTIVE

Integration among the human, animal, and environmental sectors is essential to reduce the global spread of resistance. Advancements that mobilize these sectors and promote an interdisciplinary approach are needed to facilitate information sharing among professionals and institutions (Almeida *et al.,* 2023).

5 FINAL CONSIDERATIONS

Antimicrobial resistance represents a real threat to veterinary medicine and global public health. The One Health approach offers a strategic and sustainable pathway to address this issue, promoting interdisciplinary collaboration, education, integrated surveillance, and stricter regulation of antimicrobial use. Strengthening public policies, combined with increased awareness among professionals, is essential to preserve the therapeutic efficacy of antibiotics and ensure the sanitary safety of future generations.

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