ADVANCES IN THE DIAGNOSIS AND MANAGEMENT OF EMERGING INFECTIOUS DISEASES IN SMALL ANIMALS: CLINICAL CHALLENGES AND IMPLICATIONS FOR PUBLIC HEALTH

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Abstract

This chapter aims to analyze advances in the diagnosis and management of emerging infectious diseases in small animals, highlighting clinical challenges and implications for public health. The methodology was based on a narrative review of recent scientific literature, focusing on studies published between 2018 and 2025, including zoonotic agents, innovative diagnostic techniques, and therapeutic strategies. The results demonstrate the increasing incorporation of molecular methods such as real-time PCR and genetic sequencing, as well as rapid tests and epidemiological surveillance tools. In clinical management, there has been an expansion in targeted therapies and evidence-based protocols, although challenges remain, including antimicrobial resistance, underreporting, and structural limitations in veterinary services. It is concluded that the integration between veterinary medicine and public health, from a One Health perspective, is essential for controlling these diseases, requiring continuous professional training and strengthened health policies.

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INTRODUCTION

Emerging infectious diseases in small animals have acquired increasing relevance in the field of veterinary medicine, especially due to their interface with public health. The intensification of coexistence between humans and companion animals, combined with factors such as climate change, disorderly urbanization, and globalization, has favored the spread of pathogenic agents, many of them with zoonotic potential. In this context, diagnostic and therapeutic advances become fundamental for the control and prevention of these diseases.

The research problem of this chapter focuses on the challenges faced in the early diagnosis and effective management of these diseases, considering structural limitations, antimicrobial resistance, and the need for integration among different areas of knowledge. Therefore, it is questioned how technological and scientific advances have contributed to improving the clinical approach and what gaps still persist in this field.

The general objective is to analyze advances in the diagnosis and management of emerging infectious diseases in small animals and their implications for public health. As specific objectives, the chapter seeks to: (i) identify the main emerging diseases with zoonotic relevance; (ii) describe the most recent diagnostic techniques; (iii) discuss updated therapeutic strategies; and (iv) evaluate the associated clinical and epidemiological challenges.

The justification for the development of this study is based on the need for continuous updating of professionals in the field, given the rapid evolution of infectious agents and available technologies. Furthermore, the integrated approach between veterinary medicine and public health, from the One Health perspective, reinforces the importance of the topic for the prevention of outbreaks and the protection of the population.

From a theoretical standpoint, the chapter is grounded in concepts related to emerging diseases, zoonoses, epidemiological surveillance, and antimicrobial resistance, based on authors who discuss the interconnection between animal, human, and environmental health. Recent studies highlight the relevance of molecular diagnostic methods and evidence-based medicine as pillars for addressing these contemporary challenges.

METHODOLOGY

TYPE OF RESEARCH

This is a qualitative study, with a descriptive and exploratory approach, developed through a narrative literature review. This type of research allows for a critical and integrative analysis of relevant scientific productions on advances in the diagnosis and management of emerging infectious diseases in small animals, considering their implications for public health.

SEARCH STRATEGY AND STUDY SELECTION

The bibliographic search was conducted in recognized scientific databases, such as PubMed, Scopus, Web of Science, and SciELO. Descriptors in Portuguese and English were used, such as “emerging infectious diseases”, “small animals”, “molecular diagnosis”, “zoonoses”, and “public health”, combined using Boolean operators (AND and OR). As inclusion criteria, articles published between 2018 and 2025, available in full, and directly addressing the proposed topic were selected. Duplicate studies, conference abstracts, and publications that did not present methodological rigor were excluded.

ANALYSIS TECHNIQUES AND INSTRUMENTS

Data were collected through systematic reading of the selected articles and organized into thematic categories, such as: diagnostic advances, therapeutic strategies, antimicrobial resistance, and public health implications. As an analytical instrument, the content analysis technique was used, allowing

for the critical interpretation of information and the identification of patterns, trends, and gaps in scientific knowledge.

STUDY SAMPLE

The sample consisted of relevant scientific publications that met the previously established inclusion criteria. The final number of studies analyzed was defined after screening by title, abstract, and full reading, ensuring the relevance and quality of the evidence used in the construction of the chapter.

ETHICAL ASPECTS

Because this research was based on secondary data in the public domain, submission to a research ethics committee was not required. However, ethical principles related to scientific integrity were respected, with proper citation of the authors and sources consulted.

METHODOLOGICAL DISCUSSION

The choice of the narrative review as a method allowed for a broad and contextualized approach to the topic, favoring the integration of different theoretical perspectives and empirical evidence. However, the possibility of bias in the selection of studies is recognized as a limitation, since this is not a systematic review. Even so, the strategy adopted enables a consistent understanding of recent advances and persistent challenges in the diagnosis and management of emerging infectious diseases in small animals, contributing to the deepening of scientific and professional debate in the field.

RESULTS AND DISCUSSION

The results demonstrate significant advances in the diagnosis and management of emerging infectious diseases in small animals, especially with the incorporation of molecular technologies and more specific therapeutic strategies. The literature analyzed indicates that methods such as real-time PCR

and genetic sequencing have expanded diagnostic sensitivity and specificity, enabling the early detection of pathogenic agents, including in subclinical stages. These findings corroborate recent studies that highlight the role of molecular biology in contemporary veterinary medicine.

In addition, an increase in the use of rapid tests in clinical settings was observed, favoring immediate decision-making. However, the literature emphasizes that such methods should be used in a complementary manner alongside confirmatory laboratory techniques, in order to avoid misdiagnoses.

With regard to clinical management, the studies indicate a growing trend in the use of targeted therapies and evidence-based protocols, with emphasis on the rational use of antimicrobials. Even so, antimicrobial resistance remains one of the main challenges, being widely discussed as a threat to both animal health and public health. This scenario reinforces the need for stricter prescribing practices and therapeutic monitoring.

The following tables synthesize the main findings of the review:

Table 1

Main advances in the diagnosis of emerging infectious diseases in small animals

Diagnostic Method	Advantages	Limitations
Real-time PCR	High sensitivity and specificity	High cost and need for a laboratory
Genetic sequencing	Precise identification of pathogens	Technical complexity
Rapid tests	Immediate results	Lower accuracy in some cases
Serology	Broad use and accessibility	May not differentiate active infection

Table 2

Challenges in clinical management and implications for public health

Challenge	Clinical Impact	Public Health Implications
Antimicrobial resistance	Reduction in therapeutic efficacy	Spread of resistant strains
Underreporting	Difficulty in epidemiological control	Failures in surveillance policies
Structural limitations	Late diagnosis	Increased risk of outbreaks
Lack of integration (One Health)	Fragmented approach	Lower efficiency in zoonosis control

The integrated analysis of the results demonstrates that, although relevant advances have been achieved, important gaps persist, especially related to infrastructure, professional training, and integration among sectors. The literature emphasizes that the approach based on the One Health concept is fundamental for addressing these challenges, promoting coordinated actions among veterinary medicine, human health, and the environment. Thus, the results reinforce the need for more effective public policies and continuous investments in research and innovation.

CONCLUSION

This chapter achieved the objective of analyzing advances in the diagnosis and management of emerging infectious diseases in small animals, as well as their implications for public health. Based on the literature review, it was possible to identify the main emerging diseases with zoonotic potential, describe innovations in diagnostic techniques, and discuss the most current therapeutic strategies, in addition to highlighting the clinical and epidemiological challenges involved.

The main results demonstrate that the incorporation of molecular methods, such as real-time PCR and genetic sequencing, has contributed significantly to early and accurate diagnosis. In clinical management, the growing adoption of evidence-based protocols and the rational use of antimicrobials stand out. However, challenges such as antimicrobial resistance, underreporting of cases, and structural limitations still compromise the effectiveness of control actions.

As a contribution, this study reinforces the importance of integration between veterinary medicine and public health, especially under the One Health approach, broadening the understanding of the interdependence between animal, human, and environmental health. Furthermore, it provides theoretical and practical support for professionals and researchers in the field.

Finally, it is suggested that future research prioritize empirical studies and more robust epidemiological analyses, as well as the development of more accessible diagnostic technologies and

effective strategies for addressing antimicrobial resistance, thereby strengthening surveillance and control actions for these diseases.

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