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The role of essential oils in animal health: current uses and therapeutic potential in veterinary medicine

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Abstract: *The increasing interest in essential oils (EOs) in veterinary medicine stems from their wide-ranging bioactive properties, including antimicrobial, anti-inflammatory, antioxidant, and antiparasitic effects. These natural compounds, extracted from various plant sources, present a promising alternative to synthetic drugs, particularly in the face of growing concerns regarding antimicrobial resistance. Essential oils exert their therapeutic effects primarily by disrupting microbial cell membranes, modulating inflammatory responses, and enhancing immune function. Their applications in veterinary medicine encompass a diverse array of conditions, such as bacterial and fungal infections, wound healing, parasitic infestations, and behavioral management. Despite their benefits, the use of EOs in veterinary practice necessitates a cautious approach due to potential toxicity, species-specific responses, and a lack of standardized formulations. This review aims to provide a comprehensive analysis of the current state of knowledge on the mechanisms of action, therapeutic applications, and challenges associated with the integration of essential oils into veterinary healthcare. Future perspectives emphasize the need for rigorous scientific evaluation, standardized protocols, and regulatory frameworks to ensure their safe and effective use. By addressing these challenges, essential oils can become a viable component of holistic veterinary care, offering a natural, sustainable, and effective approach to animal health and welfare.*

• Introduction

Essential oils, known for their antimicrobial, anti-inflammatory, and antioxidant properties, are gaining interest in veterinary medicine as natural alternatives to conventional treatments. They show promise in supporting immune function, gut health, and stress reduction, though species-specific sensitivities and dosing challenges remain.

• Material and method

A systematic literature review was performed using PubMed, Scopus, and Web of Science to gather relevant studies on the use of essential oils in veterinary medicine. Selection focused on peer-reviewed articles from the last 20 years, addressing therapeutic applications, mechanisms of action, and safety.

Key methods included:

- Chemical analysis: GC-MS for identifying bioactive compounds
- Antimicrobial testing: Disk diffusion and broth dilution methods
- In vivo studies: EO administration via topical, oral, or inhalational routes
- Biological evaluation: Histopathology and biochemical assessments
- Data analysis: Regression and meta-analysis techniques

• Results and discussions

Essential oils (EOs) act by disrupting microbial membranes, inhibiting enzymes, and interfering with microbial replication. They reduce inflammation by modulating immune responses and offer antioxidant effects by neutralizing oxidative stress. Some EOs also influence neurotransmitters and support gut health.

Therapeutic applications include:

- **Antimicrobial**: Tea tree, oregano, and thyme oils combat *S. aureus*, *E. coli*, and *C. albicans*, aiding wound and respiratory infection treatment.
- **Anti-inflammatory**: Lavender, eucalyptus, and peppermint oils reduce pain and inflammation, supporting recovery and gut relief.
- **Stress relief**: Chamomile and valerian oils ease anxiety and stress in animals, useful in clinics and transport.
- **Parasitic control**: Neem, citronella, and garlic oils help repel or reduce external and internal parasites naturally.

• Conclusions

Essential oils show potential as natural alternatives in veterinary care but require standardized dosing and safety validation to ensure wider use.