

# Veterinary Parasitology: Bridging Animal Health, Human Well-being, and Global Sustainability.

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## Introduction

Parasitic diseases remain one of the most persistent threats to domestic and wild animal populations. In both developed and developing regions, they are responsible for considerable economic losses, poor productivity, and increased morbidity and mortality [1, 2, 3, 4]. Veterinary parasitology, the study of animal parasites—including their biology, diagnosis, treatment, and control—is central to veterinary public health and global disease prevention.

### *The Expanding Role of Veterinary Parasitology*

Veterinary parasitology has traditionally been associated with livestock productivity and animal welfare. However, the modern scope of this field has broadened considerably [5, 6, 7]:

**Zoonotic Disease Prevention:** Many parasites, including *Toxoplasma gondii*, *Echinococcus spp.*, and *Giardia*, are shared between animals and humans. Veterinary parasitologists are essential in surveillance and control efforts to curb zoonotic transmission.

**Food Security and Safety:** Parasitic infections affect meat, milk, and egg production, thereby threatening food quality and global supply chains.

**Wildlife Conservation:** Parasites in wild animal populations can indicate environmental changes and emerging health threats, making them vital for ecological monitoring.

### *Challenges in the Field*

Despite its importance, veterinary parasitology faces multiple challenges:

**Anthelmintic Resistance:** Resistance to common antiparasitic drugs, especially in helminths like *Haemonchus contortus*, is a growing crisis in livestock management.

**Lack of Novel Therapies:** The development of new antiparasitic agents is lagging behind the emergence of resistant strains.

**Climate Change:** Altered temperature and humidity patterns influence the geographic distribution of vectors and parasites, introducing diseases into previously unaffected areas.

**Insufficient Surveillance:** In many regions, parasitic infections are underdiagnosed due to lack of infrastructure, expertise, and resources.

## *Opportunities and Future Directions*

**Molecular and Genomic Tools:** Innovations in molecular diagnostics and genomics offer unprecedented insights into parasite biology and drug resistance mechanisms.

**Integrated Parasite Management (IPM):** Combining chemical, biological, and environmental strategies can reduce dependence on anthelmintics and mitigate resistance.

**One Health Framework:** Recognizing the interconnectedness of human, animal, and environmental health, veterinary parasitology is integral to interdisciplinary disease control strategies.

**Vaccine Development:** Research into antiparasitic vaccines such as those for *Theileria* or *Fasciola* offers promise for long-term, sustainable control [8, 9, 10].

## Conclusion

Veterinary parasitology stands at a critical juncture. It must evolve to meet the demands of a changing world—marked by drug resistance, emerging zoonoses, and environmental disruption. Embracing a One Health approach, investing in innovation, and reinforcing global cooperation will ensure that veterinary parasitology continues to protect animal health and contribute meaningfully to global health resilience.

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