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Challenges and Future Directions in Wildlife Health Management in India: Integrating One Health for Sustainable Conservation

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Abstract:

India's rich wildlife biodiversity plays a crucial role in maintaining ecological balance, yet it faces increasing threats from habitat fragmentation, climate change, emerging infectious diseases, and expanding human–wildlife interactions. These challenges have elevated wildlife health management as a critical component of biodiversity conservation and public health. The One Health approach, which integrates human, animal, and environmental health, provides an effective framework for addressing complex health issues at the wildlife–livestock–human interface. This article discusses the significance of wildlife health, the evolving role of veterinarians in disease surveillance, rescue, rehabilitation, and conservation, and the importance of interdisciplinary collaboration. It highlights key challenges, including inadequate surveillance systems, limited specialized infrastructure, shortage of trained wildlife veterinarians, illegal wildlife trade, and the influence of climate change on disease dynamics. The article further explores future directions involving advanced molecular diagnostics, genomic technologies, artificial intelligence, geographic information systems (GIS), remote sensing, and integrated disease surveillance to strengthen wildlife health management in India. Greater investment in research, capacity building, and institutional collaboration is essential for enhancing preparedness against emerging zoonotic diseases and supporting sustainable conservation. By adopting the One Health framework, India can improve wildlife health, safeguard biodiversity, and protect livestock and human populations from emerging health threats.

Keywords: One Health, Wildlife Health, Conservation Medicine, Zoonoses, Biodiversity

Introduction:

India possesses extraordinary biological diversity, supporting a wide variety of mammals, birds, reptiles, and other wildlife that are fundamental to healthy ecosystems. However, increasing urban expansion, habitat degradation, climate variability, and closer interactions among wildlife, domestic animals, and humans have created new challenges for disease prevention and biodiversity conservation. In this changing scenario, wildlife health has become a vital component of biodiversity conservation and public health. The One Health approach provides an integrated framework that recognizes the close relationship between animal health, human health, and environmental well-being.

Importance of Wildlife Health

Healthy wildlife populations contribute to ecological stability by maintaining food chains, pollination, seed dispersal, and natural population control. Disease outbreaks in wildlife can disrupt ecosystems and, in some cases, spill over into livestock and human populations. Events involving avian influenza, Nipah virus, rabies, and bovine tuberculosis demonstrate how diseases at the wildlife-livestock interface can have far-reaching consequences. Continuous health monitoring of free ranging and captive

wildlife is therefore essential for early detection and effective disease management.

Expanding Role of Veterinarians

Modern wildlife veterinarians perform responsibilities that extend far beyond clinical treatment. Their work includes disease surveillance, rescue and rehabilitation of injured animals, preventive healthcare, quarantine management, diagnostic investigations, and participation in conservation programmes. They also collaborate with forest officials, ecologists, microbiologists, epidemiologists, and public health professionals to investigate disease outbreaks and develop preventive strategies.

With the advancement of veterinary science, wildlife health management now combines clinical expertise with laboratory diagnostics, epidemiology, pathology, and conservation biology.

One Health: A Collaborative Strategy

The One Health concept emphasizes that the health of people, animals, and ecosystems cannot be addressed independently. Wildlife often serves as an important indicator of environmental changes and Emerging disease threats. Effective implementation of One Health requires coordinated surveillance systems, information sharing

among institutions, rapid diagnostic support, and multidisciplinary research.

Important components of a successful One Health program include:

- Integrated disease surveillance across wildlife, livestock, and humans
- Advanced molecular diagnostic techniques
- Monitoring of antimicrobial resistance
- Environmental risk assessment
- Community awareness and education
- Collaboration between veterinary, medical, and environmental sectors

Major Challenges in Wildlife Health Management

Despite significant progress, several obstacles continue to affect wildlife healthcare in India. One of the most pressing challenges is the shortage of specialized wildlife veterinarians and dedicated diagnostic laboratories. Disease surveillance in free ranging wildlife remains difficult because of inaccessible habitats and limited field infrastructure. Habitat fragmentation and increasing human encroachment have intensified human–wildlife interactions, increasing opportunities for disease transmission.

Climate change further complicates disease ecology by influencing vector

distribution, parasite survival, and host susceptibility. Illegal wildlife trade and transboundary movement of animals also facilitate the spread of infectious diseases. Limited financial resources and inadequate research funding continue to restrict long-term wildlife health monitoring programmes.

Future Directions

Strengthening wildlife health systems requires investment in both infrastructure and human resources. Modern technologies such as genomic sequencing, geographic information systems (GIS), artificial intelligence, and remote sensing are improving disease surveillance and outbreak prediction. Portable diagnostic tools and digital reporting systems can enhance field-based disease detection.

Greater emphasis should also be placed on training veterinarians in wildlife medicine, expanding interdisciplinary research, and establishing stronger collaborations between veterinary universities, zoological parks, forest departments, and public health agencies. These initiatives will improve preparedness for Emerging diseases while supporting biodiversity conservation.

Personal Perspective

As an M.V.Sc. scholar in Veterinary Medicine involved in wildlife-based research, I have observed that maintaining

the health of captive and rescued wild animals requires an integrated scientific approach. Regular health surveillance, timely diagnosis, effective parasite control, and collaboration between veterinarians and wildlife managers are essential for improving animal welfare and conservation outcomes. These experiences reinforce the importance of applying One Health principles in routine wildlife healthcare.

Conclusion

Wildlife health is an indispensable component of environmental sustainability, livestock health, and human well-being.

The growing risk of emerging infectious diseases highlights the need for stronger surveillance systems, scientific research, and interdisciplinary collaboration. By embracing the One Health approach and strengthening wildlife healthcare infrastructure, India can better conserve its rich biodiversity while protecting both animal and public health for future generations.

References:

Please contact the corresponding author.