Shifting from wildlife disease threats to wildlife health

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Summary

The evolution of wildlife disease management and surveillance, as documented in the World Organisation for Animal Health's *Scientific and Technical Review*, reflects a deepening understanding of the links between wildlife health, ecosystem integrity and human well-being. Early work, beginning with the World Assembly of Delegates in 1954, primarily focused on diseases like rabies. This focus expanded over time to include broader concerns such as the impacts of climate change, habitat loss and increased human–wildlife interactions on wildlife health. By the late 20th century, the emphasis had shifted towards improved practices for wildlife disease control and the development of advanced diagnostic methods and vaccines. Articles in the *Review* highlight the growing complexity of wildlife diseases and the need for holistic management strategies. The adoption in recent years of cutting-edge technologies like CRISPR-Cas systems and metagenomics points to a future of more proactive and integrated approaches to wildlife disease management. There is still a need to address not just the consequences of wildlife diseases but also their anthropogenic drivers. The latest perspectives advocate for nature-based solutions, expanded partnerships and systems-level thinking to effectively tackle 21st-century challenges in wildlife and biodiversity conservation.

Keywords

Biodiversity – Conservation – One Health – Wildlife – Wildlife diseases – Wildlife health – Zoonoses.

The evolution of wildlife disease management and surveillance over the decades reflects a growing awareness of the interconnectedness among wildlife health, ecosystem integrity and human well-being. The World Organisation for Animal Health (WOAH, founded as OIE) World Assembly of Delegates adopted its first resolution on wildlife in May of 1954, at the 22nd General Session, on the subject of rabies. While the progression from basic recognition of wildlife diseases to the development of sophisticated surveillance systems and advanced diagnostic technologies mirrors the increasing complexity of challenges faced in wildlife conservation, the papers published in WOAH's *Scientific and Technical Review* reflect a consistent call to recognise the importance of wildlife health. Over the years, different rationales or justifications, such as controlling diseases in livestock or protecting the health of humans, have been offered in support of wildlife disease research, surveillance and management.

The multitude of challenges facing wildlife include climate change, habitat loss and burgeoning human–wildlife interactions, which necessitate not only more effective disease management strategies but also a holistic approach to biodiversity conservation. While the challenges themselves may not have changed over the decades, the scale and geographic scope of their impact has grown, and modern travel facilitates the rapid movement of pathogens, vectors and hosts. The non-consumptive utilisation of wildlife as well as trade in wildlife and wildlife products has grown significantly, presenting both new opportunities and increased risks of disease emergence and spread. The opportunities for multisectoral partnerships and cross-fertilisation, such as the use of cutting-edge technologies like CRISPR-Cas systems, indicate a future in which wildlife disease management is more proactive, precise, integrated with broader goals and aligned with global efforts to preserve biodiversity and prevent zoonotic disease emergence.

Interestingly, early publications in the *Scientific and Technical Review* suggested a broader approach to wildlife diseases, more like today's thinking than illustrated during the intervening years. A 1988 publication by Plowright underscored the initial underappreciation of wildlife diseases and discussed challenges in researching them [1]. It emphasised the need for more veterinary contributions to this field, highlighting the difficulties in disease recognition and reporting in wildlife. The paper argued for enhanced training in epidemiology and ecology for both wildlife veterinarians and biologists, underlining the importance of continuous access to animal populations for effective disease detection and monitoring.

In 1996, a special issue of the *Scientific and Technical Review* focused on the husbandry and care of wild animals in captivity [2], highlighting the need for improved housing, feeding and management practices and constant vigilance against diseases, as well as further research on specific animal diseases and adaptation of diagnostic tests developed for domestic animals. Of note, the discussions on how factors such as nutrition, the environment and social factors affected health outcomes of captive wildlife are not dissimilar to those being recognised in free-ranging wildlife populations.

By the 1990s, new methods for diagnosing animal diseases and new vaccines derived from genetic engineering had been developed, and thus new opportunities for the monitoring and management of wildlife diseases became widely available. A 2002 article by Mörner *et al*. titled 'Surveillance and monitoring of wildlife diseases' [3] discusses the significance of disease surveillance in wild animal populations for early detection of infectious diseases, including zoonoses. It highlights the importance of establishing national strategies for disease detection and monitoring and the benefits of efficient wildlife disease monitoring programmes. These programmes are crucial for detecting new and emerging diseases, which can have significant zoonotic and economic implications.

Delving further into diagnostics, Michel *et al*.'s 2021 article entitled 'Pathogen detection and disease diagnosis in wildlife: challenges and opportunities' [4] discusses the increasing need for pathogen detection and disease diagnosis in wildlife due to the growing human–wildlife interface. It addresses the challenges in developing and validating diagnostic tests for wildlife, emphasising the complexities compared to domestic animals. The article explores the advantages of novel technologies, such as CRISPR-Cas systems and metagenomics, for pathogen detection and disease diagnosis in wildlife and highlights the potential of these technologies in managing emerging diseases and conservation efforts.

Over 150 articles on wildlife have been published in the *Scientific and Technical Review* over the years, including in several special issues dedicated to wildlife, One Health and the environment. They demonstrate a shift in thinking from identifying threats from wildlife to better disease management and conservation efforts, reflecting an increased understanding of the critical role of wildlife health in global ecosystems and the health of the planet. While much discussion has focused on responding to disease events and poor health outcomes, not enough effort has been made to address the underlying anthropogenic drivers that produce them. Unless researchers engage and help to inform decision-making on issues critical to ecosystem health, such as land-use practices and

planning, natural resource utilisation, sustainable agricultural development and fisheries management, responding to the adverse health consequences will consume most if not all professional resources.

Refreshingly, Uhart and Sleeman [5] provide a forward-looking perspective in this centenary retrospective on the intrinsic value of ensuring healthy wildlife populations and discuss what is now needed for surveillance and information management, nature-based solutions and expanding partnerships to promote successful wildlife health management. While learning from the last 100 years of experience is essential, it is necessary to move beyond simply increasing the quantity of the same 20th-century solutions to individual 20th-century problems and develop new models of systems-level thinking to more effectively solve the 21st-century challenges facing wildlife and biodiversity, or, in other words, the health of all on this planet.

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