

BOOK REVIEW

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Climate Change and Animal Health. 1st Ed. Edited by Craig Stephen and Colleen Duncan. CRC Press, Boca Raton, Florida, USA. 2022. 334 pp. ISBN-10 0367712. ISBN-13 978-0367712013. US\$167.76 (hardcover), US\$61.99 (paperback), and US\$58.89 (eBook).

Review by Glenn R. Guntenspergen

Climate change poses challenges to wildlife. Clear evidence has documented these effects. In addition to phenologic mismatches and changing migratory patterns, rising temperatures and changing environmental patterns affect wildlife health. Identifying and evaluating different climate adaptation strategies could help conservation organizations confront these challenges. In addition to the impacts on wildlife, a changing climate affects domestic animals and human health and the transmission of diseases. A substantial omission to the literature is the lack of a comprehensive text that addresses the interrelationship of climate change and the health of domestic animals, wildlife, and humans.

Climate Change and Animal Health, edited by Craig Stephen and Colleen Duncan, seeks to address this gap. This book builds on a previous effort edited by Craig Stephen, *Wildlife Population Health*, which included a chapter on climate change that presages the current volume. Stephen and Duncan have brought together an international group of authors from academia, public health agencies, and the World Organization for Animal Health to cover a variety of issues on this theme. This

new book has the space to cover a broad range of topics in its 17 chapters, including animal health, zoonoses, contaminants, hazards, and economics. In addition to a review of each topic, there is an educational focus to the book illustrated by the common format of the chapters, including boxes that introduce the topic and inform what the reader will learn from the chapter (Key Learning Objectives) and how this information can be turned into actions (Implications for Climate Action).

Climate Change and Animal Health is the fourth contribution to the CRC Press *One Health One Welfare* series that promotes the interrelationship between the health of domestic animals, wildlife, humans, and the larger environment. The One Health approach has its origins in the work of Rudolf Virchow and William Osler, who were interested in the linkages between human and veterinary medicine. The modern version of this concept calls for an interdisciplinary approach and increased collaboration between the human and veterinary medical communities. I read with interest to see how the editors could take a complex topic such as climate change and animal health and use the One Health concept to provide a unifying structure for the book.

The 17 chapters are organized into three sections and a concluding chapter. The first section comprising five chapters is heavily influenced and guided by Stephen and Duncan and provides an overview of the subject of climate change and animal health. Chapter 1 provides a primer, introduces several important concepts, and serves as an introduction to the voluminous literature on climate change.

Most importantly, the concept of threshold responses is introduced. Threshold responses can have broad relevance, but additional views based on human values about ecological systems and concepts that reflect management objectives and values can provide a broader framework for considering the use of threshold responses to new conditions of exposure to animals and ecosystems. Chapter 2 provides Stephen an opportunity to explain animal health in the context of the socioecological impacts of climate change. He emphasizes the importance of the threshold responses introduced in the previous chapter and the uncertainty associated with identifying thresholds in animal health. Chapter 3, also written by Stephen, continues the development of the theme of animal health and climate change. The focus of this chapter is on action and covers mitigation, adaptation, resilience, and harm reduction. The concept of harm reduction is a call to action for professionals to engage not only at a local level but also through National Climate Adaptation Plans. Chapter 4, written by Duncan and coauthors, examines climate-associated diseases in animals. The theme of this chapter is the study of disease in individuals and groups and the classification of climate-driven disease to build support for intervention strategies. Chapter 5, the concluding chapter of this section, by Stephen and coauthors, is a literature review of animal health and climate change that not only covers diseases but also expands our vision to view climate–health interactions across the whole range of health outcomes. They promote the idea that intervention by humans before harm emerges is a more proactive way to build resilience.

The second section of the book (Chapters 6–10) examines the specific impacts of climate change on animals and society. Chapter 6 examines infectious animal diseases, whereas Chapter 7 focuses on zoonoses—of particular interest in our current, postpandemic world and the topic of many recent books. Chapter 8 covers the topic of contaminants and how climate change and contaminants act as cumulative stressors on wildlife health. This chapter concludes with a call for future research to examine this interaction at the

ecosystem level and to anticipate the effect on wildlife and the environment. Chapter 9 covers the effect of climate-related disasters and hazards on animals and provides a proactive focus on protecting the safety, health, and welfare of animals. Chapter 10 concludes this section by offering a primer on economics, climate change, and animal health. An understanding of economics is a critical component for making plans to protect animal health. More importantly, economics provides a platform for understanding how resources may be targeted to either adapt or mitigate the effects of climate change.

The concluding seven chapters (Chapters 11–17), in the third section of the book, provide insight on how individuals, organizations, and international bodies can use a One Health framework to integrate animal health into climate change response. Chapters 12 and 13 emphasize that climate–animal health relations are complex and that humans cannot anticipate all outcomes. Building on the theme of threshold responses earlier in the book, Chapter 12 discusses the related concept of tipping points, where a system subject to stress suddenly shifts from one state to another. Often, these tipping points are only recognized in retrospect. Chapter 13 heavily promotes the concept of using animal health surveillance systems that can be adapted to foresee unexpected events. Chapters 14–16 discuss a range of policy and public health approaches to address the impact of climate change on animal health and emphasize the role of education in providing the multidisciplinary perspective needed to address these complex impacts. Chapter 15 is aspirational in examining the concept of hope and innovative approaches to public and animal health to find meaningful solutions that can inspire action. This chapter also builds on the previous ideas of surveillance and monitoring to discuss how tools such as the Environmental Justice Screening Tool developed by the US Environmental Protection Agency can combine individual indicators to address socioeconomic and health marginalization. Chapter 16 directly addresses the veterinary sciences and the role of education to confront the complexity of climate change and

animal health. The authors of this chapter promote the need for veterinary schools to adopt interdisciplinary approaches to animal health. In the concluding chapter, the editors summarize the key messages found in the book, thereby providing the reader with the tools and knowledge to meet the challenges associated with the climate crisis in animal health. They emphasize the importance of individual actions that can lead to cumulative impacts, but also recognize that working collectively at local, regional, and national levels, and with a cross-section of conservation and health groups, is a necessity. They highlight the need to be proactive in the face of uncertainty and not wait for science to catch up with the problem. Stephen and Duncan advocate for a new approach to protect animal health that may lead to changes in the status quo and keep animals healthy in the face of unprecedented climate change.

This book promotes a hopeful approach to protecting animal health. It clearly outlines the

challenges and emphasizes new approaches that educators, practitioners, and researchers can embrace to promote animal health in an era of climate change. Collectively, this book focuses on the key points for action. Although the One Health paradigm may have been an inspiration for the approach used in this book, the experiences, lessons learned, and opinions of this group of authors provide a syllabus for action and learning. This book is not an in-depth examination of every topic that is introduced, but it is appropriate as an introductory text in a curriculum focused on climate change and animal health or as a tutorial for practitioners or interested individuals who seek an entry into this topic. The book is available in several formats including hardback, paperback and eBook and priced accordingly.

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