

Arctic One Health: Challenges for Northern Animals and People

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Source: Journal of Wildlife Diseases, 61(1) : 276-280

Published By: Wildlife Disease Association

URL: <https://doi.org/10.7589/0090-3558-61.1.BR2>

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BOOK REVIEW

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Arctic One Health: Challenges for Northern Animals and People. Edited by Morten Tryland. Springer Nature Switzerland, Cham, Switzerland. 2022. 575 pp. ISBN: 978-3-030-87852-8; ebook ISBN 978-3-030-87853-5. CAD\$322/US\$230 hardcopy (Amazon).

Review by Alexandra C. Jerao

Imagine yourself, *JWD* reader, sitting in front of the fireplace in a cabin, with a hot beverage in hand. It's the middle of winter and the wind is howling outside, which prompts you to huddle a bit closer to the warmth of the fireplace. In this moment, you consider the cabin: it has a solid foundation, a sturdy frame, four walls, and a roof to keep the elements at bay. Consistent maintenance prevents drafts, and the fireplace requires attention to keep the fire burning. One Health programs are like this cabin. They require a solid foundation of understanding how the health of the environment, animals, and humans are interconnected; a framework of peer-reviewed evidence; and careful evaluation to ensure program sustainability. Community engagement and attention to the local context are key to community and stakeholder buy-in, and to program success. Building these One Health programs, like building a cabin, is not easy, and there is often no clear direction on what needs to be considered when developing such a program.

Morten Tryland's *Arctic One Health: Challenges for Northern Animals and People* provides the blueprints for building this sturdy winter cabin. It is a solid representation of the One Health systems approach to health and life

in the Arctic, which allows the reader to appreciate the complex challenges facing today's Arctic. The book is not a how-to manual on developing One Health programs for the Arctic, but it provides many case examples of ongoing activities in the field and clearly lays out the important elements that should be considered for any complex issue facing the inhabitants of the north. For anyone who works in the field of One Health, whether it be in ecosystem health, environmental contaminant monitoring, disease surveillance, wildlife management, or food safety and security in the Arctic, or in providing veterinary services to remote communities, a copy of this multiauthored contribution should be added to your bookshelf.

Upon perusal of the table of contents, many *JWD* readers (myself included) may be most excited to explore the 12 zoonotic diseases described in the middle of this book, and truly, the section is wonderfully researched and detailed and stands as an exemplar. However, wildlife and zoonotic diseases cannot be removed from the greater context of environmental and human health, and these "other" sections are extremely well written and deserve attention. The entire book is worthy of being read from start to finish, and readers from all backgrounds will find a renewed interest in this engaging and important topic.

The *JWD* readers who pick up *Arctic One Health* will appreciate the scope, depth of detail, and thoroughness provided in each chapter, as they move from the introductory section on the Arctic inhabitants, wildlife, and principles of One Health, to environmental hazards, zoonotic

diseases, food safety, and community involvement in real-life programs. The reader will delight in the images, figures, and detailed tables that add much richness to the topics and stories being told in each chapter. Many readers will appreciate how all these details come together to provide a holistic overview of One Health challenges in the Arctic. For readers who are new to working in the Arctic region, and for experienced professionals looking for a well-rounded resource on current One Health issues in the circumpolar north, look no further than Tryland's 575-paged opus.

The book consists of 25 chapters by different authors in five major sections, beginning with an introduction that sets the foundation of knowledge for the reader. The concept of One Health, which "recognizes the interdependence of human, animal, and environmental health, ... and [that] the wellbeing of all will lead to improved health outcomes and enhanced resilience," is well illustrated in the three introductory chapters. First, the reader will be familiarized with the Arctic region and its inhabitants, including the historical habitation by Indigenous peoples and recent settlements of non-Indigenous peoples in the Arctic regions across the globe. Chapter 2 ("A Holistic Approach to One Health in the Arctic") outlines the importance of "[bringing] in expertise across natural and social sciences and [synergizing] western science with traditional Indigenous Ways of Knowing," as illustrated by Two-eyed Seeing, an Indigenous concept that encompasses the spirit of One Health, and the inter-professional challenges with operationalizing One Health. The third chapter provides an overview of seasonal animal migrations and their impacts on Arctic ecology and the spread of infectious disease, as well as the impacts that climate change and human structures have on habitat loss and conservation efforts. This foundation sets the stage for the four main sections of the book: major environmental health threats to Arctic animals and people; Arctic zoonoses; threats to harvesting, food safety, and food sovereignty; and working with Arctic communities for wildlife health surveillance, access

to veterinary care, and the management of semi-domesticated reindeer.

The first of these four sections covers five major environmental health threats to Arctic animals and people. In perhaps the most thorough chapter, the "past, present, and projected changes in global- and Arctic climate and environment" are explored (Chapter 4, "Climate Change in Northern Regions"). The authors of this chapter frame the underlying drivers (and the associated hazards and impacts) of climate change across various Arctic regions with a look forward to Arctic resilience, adaptation, and notes on government. The most important points (global temperature increase, greenhouse gas concentrations, sea level rise, sea ice extent, climate risk) throughout the chapter are hammered into the framework with robust maps, graphs, figures, and tables. This chapter incorporates recent data from relevant sources, such as the Arctic Monitoring and Assessment Program, Intergovernmental Panel on Climate Change, and the peer-reviewed literature, which provide irrefutable evidence that climate change affects human, animal, and environmental systems. The chapter concludes with the strong reiteration that "the Arctic is warming twice as fast as the global average," and that even with ambitious mitigation, the Arctic will see unprecedented challenges that will affect every aspect of the region.

If your area of interest is in environmental health, then the next four chapters will intrigue and satisfy. Chapter 5 ("Loss of Untouched Land") explores the interconnectedness of human activities, reindeer husbandry, and climate change on Arctic greening and environmental health. The author provides thoughtful commentary on human activities that induce land cover change, and although solutions are not explicitly stated, the reader will nonetheless contemplate the need to balance infrastructure maintenance, wildlife migration corridors, and the preservation of the vulnerable Arctic untouched land. Chapter 6 ("Arctic Ecosystems, Wildlife and Man: Threats from Persistent Organic Pollutants and Mercury") is robust in the coverage of human, wildlife, and environmental

health effects of mercury and persistent organic pollutants across the Arctic. Using surveillance data on humans and wildlife across the circumpolar Arctic, and figures that will intrigue both students and experts alike, the authors summarize the accumulation of these pollutants in the Arctic and the disproportionately severe illnesses that face Indigenous peoples, wildlife, and domesticated animals that call this region home. At the chapter's conclusion, there is a push to continue One Health surveys on both wildlife and human health to better understand the interactions between environmental change, contaminant exposure, and the increasing risk of Arctic zoonoses.

Oil spills and nuclear radiation are covered in the final two chapters in this section (Chapters 7, "Oil Spills in the Arctic," and 8, "Nuclear Radiation"). The reader is guided through the damage caused by oil contamination in the environment: the effects of oil spills (e.g., the 1989 *Exxon Valdez* disaster) on the environment, marine wildlife, birds, and humans. A heavy emphasis is placed on the need for emergency preparedness and response, as well as ongoing efforts to aid in ecosystem recovery after oil spill disasters. Chapter 8 is fairly dense with its review of anthropogenic radionuclides and their direct harm to animals, as well as their potential for harm as they enter the human food chain through terrestrial animals and vegetation. Reindeer (*Rangifer* spp.), certain wildlife species, and freshwater fish in some Arctic areas are at the highest risk of damage due to radioactive material from the 1986 Chernobyl accident. Although no demonstrated increase has been seen in adverse human health effects such as cancer in the Arctic regions, there is still a necessity for countermeasures and dietary restrictions on certain foods for Arctic and Subarctic populations.

Readers with an interest in zoonoses will find the third section detailed, thorough, and satisfying. No fewer than 12 zoonotic diseases or disease groups are described: rabies, brucellosis, anthrax, cystic and alveolar echinococcosis (*Echinococcus canadensis* and *E. multilocularis* infections), toxoplasmosis, trichinellosis,

cryptosporidiosis and giardiasis, erysipelas, tularemia, orthohantavirus infections, marine nematode and cestode infections, and parapoxvirus infections. Each chapter contains an introduction to the disease, its history in the Arctic, relevant environmental-host-pathogen details, clinical manifestations, and the disease's impact on wildlife species, domesticated animals, and people. Region-specific prevalence and contributing factors are coupled with diagnoses and surveillance programs and with existing prevention and control activities. Each disease chapter concludes with an outlook for prospective disease management plans and challenges presented by the rapidly changing climate and environment.

With the exploration of climate change, environmental threats, and zoonoses in the previous sections, the reader is brought into the reality of harvesting food in the Arctic. In Chapter 21 ("Hunting with Lead Ammunition"), the authors thoroughly illustrate the effects of lead poisoning in wildlife, lead contamination in the environment, and the hazards of lead exposure to humans due to lead-based ammunition. Chapter 22 ("Traditional Conservation Methods and Food Habits in the Arctic") is perhaps the most unique and enjoyable chapter of the entire book, especially for *JWD* readers who enjoy qualitative research. The authors, R. Stimmelmayer and G. Sheffield, demonstrate their expertise and experience working with Indigenous communities in Alaska, and in roughly 25 pages demonstrate an incredible understanding of the principles of traditional Arctic food systems, including hunting, food processing and storage, and food sharing. The chapter examines Indigenous traditional food systems and practices and the inherent understanding of One Health in Indigenous culture, with a special emphasis on wildlife health and food safety that *JWD* readers will appreciate. The strength of the chapter lies in the first-hand experience in working with Indigenous communities to share knowledge on food safety, zoonotic disease, and food contaminants, so that the reader can appreciate "food wisdom" and the traditional ecological knowledge so deeply ingrained in

Indigenous people's cultural identity. The chapter is elevated with photos and text examples. These illustrate and enrich the concepts, leaving the reader with a desire to better integrate traditional knowledge into all aspects of research and policy involving Arctic One Health issues.

Thereafter, the stage is set for exploring the fifth and final section of the book: working with Arctic communities. Chapter 23 ("Wildlife Health Surveillance in the Arctic") reiterates the importance of utilizing a One Health approach to wildlife health surveillance programs and uses case studies of ongoing community-based programs, such as the muskox (*Ovibos moschatus*) health surveillance initiatives in Nunavut and the Northwest Territories, Canada, to illustrate the concept. The case study describes how local knowledge, provided by community member interviews and participatory activities, is combined with scientific knowledge, gathered through hunter-based sampling, scientific studies, and field investigations of disease, to monitor the health of the muskoxen. This participatory approach to wildlife health surveillance provides "more value for early detection of new diseases or changing disease trends" and holds potential to "improve surveillance capacity and interventions for both wildlife management and public health."

Following the theme of community-based and participatory programs, the reader learns more about access to veterinary care in the Arctic in a chapter that focuses on the special relationship between dogs and humans in the circumpolar north (Chapter 24, "Dogs and People: Providing Veterinary Services to Remote Arctic Communities"). The authors artfully outline the key principles for successful subsidized veterinary programs, beginning with the need for community engagement, emphasizing that service providers should "take the time to understand local needs [to] ensure the team and services provided are trusted and welcome." Demonstrating the impacts of the program through animal health (spay/neuter surgeries, vaccines, and other care), human health (both physical and mental health using metrics specific to the community), and environmental

health (water safety and availability, disease transmission) measurements is an essential component of program evaluation. Sharing this knowledge with the community and other partners is crucial for program sustainability. The authors then provide a thorough and detailed analysis of the challenges with dog population management and preventative care when accessing remote Arctic communities is neither simple nor inexpensive. The chapter concludes with a reminder that sustainable programs require community buy-in and support, and trust-building and engagement are perhaps the most important activities when building successful subsidized veterinary programs.

Tryland's book concludes with a self-authored chapter, "Semi-Domesticated Reindeer, Health and Animal Welfare" (Chapter 25). The tradition of herding reindeer is explored, with a historical look at epizootics caused by *Fusobacterium necrophorum* and anthrax, before reflecting on current reindeer management challenges. Loss of pastureland, climate change, and food scarcity require management changes, such as supplemental feedings, which can predispose to ruminal acidosis and often increases animal-to-animal contact, which facilitates pathogen transmission. Although reindeer health and herd management are very niche-focused, this chapter includes pieces from all previous topics: health threats to Arctic animals and people, Arctic zoonoses, harvesting and food safety, and working with Arctic communities, bringing them together as an example of current One Health activities. Unfortunately, this final chapter does not conclude with a "look to the future" for reindeer health management and ends both this section and the entire book on a somewhat unfinished note.

Regrettably, there are a few cracks in the walls of this cozy cabin textbook. For all its charms, the text lacks the warmth of the Indigenous perspective. Although several chapters do well including images and descriptions of programs that work with Indigenous peoples in community-based projects and programs, little discussion or input is given from Indigenous peoples themselves. Perhaps most surprisingly,

the first chapter of the text (“The Arctic Region and Its Inhabitants”) sets a very cool, almost clinical tone to the book, which could be warmed up with the inclusion of even a small amount of Indigenous culture and how it varies across the circumpolar north. Many of the chapters approach their topics from a very scientific, Western approach, but fail to pair them with the vibrancy of Indigenous Ways of Knowing. This partnership between Western and traditional knowledge is the basis of Two-eyed Seeing, a fundamentally One Health approach. Although Two-eyed Seeing is introduced to the reader in Chapter 2, it is not (functionally) revisited until Chapter 22 (“Traditional Conservation Methods and Food Habits in the Arctic”) and is best demonstrated in Chapter 23 (“Wildlife Health Surveillance in the Arctic”). Qualitative studies that embrace individual and group interviews as part of program assessment are rare, nevertheless they do exist, and every chapter would have benefited from the inclusion of this first-hand perspective. If anything, a final chapter on working with Arctic communities that included One Health and Two-Eyed Seeing operational frameworks, cultural sensitivity, community mobilization, participatory research, and Indigenous reflections on any such projects mentioned as case studies would have rounded out the book and provided a solid example on how One Health needs to progress.

Arctic One Health provides a thorough examination of the major environmental challenges, wildlife diseases, and Arctic zoonoses as well as the overt risks to human health and food safety particular to the social and cultural context of life in the Arctic. Wildlife managers, researchers, and veterinarians will find this book to be a solid example of the field and will be pleased with the expertise provided on the One Health issues that the Arctic region

faces. Any reader who is unfamiliar with the Arctic or subarctic region will find more than one chapter that catches their interest and encourages them to investigate a topic more thoroughly. I found myself particularly entranced by the pathways in which beluga whales (*Delphinapterus leucas*) are exposed to spilled oil, and, at the same time, imagining what it would be like to help process and preserve a landed whale in the Bering Strait region. Many chapters have excellent insights into familiar topics, which provide the reader with new ideas to integrate into their programs. Clearly, the book does achieve its primary goal: to have students and professionals “engaged in this Arctic region and learn about the many ways this vulnerable region of the planet is challenged.” Beyond engagement, the book provides a solid One Health foundation and frames the Arctic context with discussion and examples of environmental hazards, wildlife health concerns and zoonotic disease, food safety and public health, and current surveillance and wildlife management programs. Peer-reviewed literature, data from ongoing surveillance programs, and expert opinions provide a strong framework, and ample case examples, photographs, figures, and text quotations provide the spark that turns into roaring excitement for the topic at hand and breathes life into the book. Despite its very few shortcomings, *JWD* readers will find this textbook to be a detailed, thorough, and well-rounded resource on current issues affecting One Health in the Arctic. So, grab a copy, settle into your favorite chair, and build your own One Health “cabin” following the blueprints provided in *Arctic One Health*.

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