

## BOOK REVIEW

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**Taking the Bite Out of Rabies: The Evolution of Rabies Management in Canada.** Edited by David J. Gregory and Rowland R. Tinline. University of Toronto Press, Toronto, Canada. 2020. 642 pp. ISBN 978-1-4875-0428-1. US\$200.00.

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*Review by Donna M. Gatewood*

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Rabies has been a part of human history for thousands of years, and the horror of the disease has been woven into written documents and literature for nearly as long. Cuneiform tablets and other artifacts discovered in archeologic digs in the Middle East provide examples of written rules and regulations attesting to the fact that a causal link between the bite of a suspect rabid animal and a human death from rabies may have been recognized almost 4,000 years ago, before its postcolonial historical appreciation within the New World (Tarantola 2017).

Within the public sphere, more recently Stephen King's best-selling 1981 novel *Cujo*, about a friendly St. Bernard that becomes murderous after being bitten and infected by a bat, has the following passage:

It would perhaps not be amiss to point out that he had always tried to be a good dog. He had tried to do all the things his MAN and his WOMAN, and most of all his BOY, had asked or expected of him. He would have died for them, if that had been required. He had never wanted to kill anybody. He had been struck by something, possibly destiny, or fate, or only a degenerative nerve disease called rabies. Free will was not a factor.

Rabies has been and continues to be a threat to domestic animals and human popu-

lations, even with modern day control measures. Eradication is not feasible because of the many and diverse wildlife reservoirs, some of which harbor and shed the virus for long periods of time without evidence of the disease. Most, if not all, developed countries have effective rabies prevention and control measures, some to the point that the disease in humans is quite rare. For example, the US generally documents only zero to three human cases per year (Centers for Disease Control and Prevention 2020). Most of those are a result of an unrecognized bat bite or are imported by people who traveled to countries where the disease is prevalent in dogs. Yet globally, an estimated 50,000–70,000 human deaths per year are caused by rabies, with tens of millions of exposures, so it clearly is not a fully controlled disease. Paradoxically, as developed countries achieve relative success with controlling this zoonosis, public awareness fades, and the political will to continue funding control efforts decreases.

*Taking the Bite Out of Rabies* is a comprehensive collection of historical perspectives, scientific information, descriptions of data-based lessons learned, and outcomes of the Canadian approach to rabies prevention and control. The national program in Canada is one of the success stories that bears telling, as it can inform and guide others who are developing or refining a rabies control program. It is also a good read for scientists and public health professionals who have an interest in managing and mitigating spread of infectious diseases in general or those who have an interest in the history of such efforts.

The book has 39 chapters divided into nine sections. For each chapter, the editors en-

gaged subject matter experts who skillfully weave their various topics into a cohesive tome that has broad audience appeal. By design, the editors arranged the book in such a way that a reader who is interested in the topic of wildlife rabies control in general, but is seeking specific information about a particular aspect, need not read the entire book to benefit from its content. For example, Part 1, “The Basics of Rabies in Canada,” begins with a chapter that thoroughly covers current knowledge of the biology of rabies viruses, and it is followed by a chapter about the occurrence of rabies in domestic animals and wildlife in Canada. It concludes with a chapter documenting cases of rabies in humans, including an entertaining account of “The Myth of the Duke of Richmond.”

Part 2 is titled “The Role of Federal Agencies in Rabies Management” and describes the evolution of the cooperative efforts between the Federal Department of Agriculture and the Canadian Public Health Agency. This not only would be of particular interest to those interested in rabies control in Canada, but also could be quite informative for readers in countries that are in the process of initiating or refining rabies control programs.

The authors then drill more deeply in Part 3 into the history of rabies in the Canadian provinces and territories, along with control efforts, with 10 chapters each devoted to one or a small group of regions. Each chapter is further divided into parts, titled “Place,” “Rabies in <Province or Territory>,” “Rabies Management,” and “Discussion.” The perspectives of these chapters include geographical characteristics, wildlife habitats, population densities, historical aspects, and the region-specific factors that influenced and informed the rationale(s) behind approaches to rabies control. This comprehensive body of information would be of interest to anyone who is seeking information about the multitude of factors that are critical to consider when establishing a local rabies control program.

Part 4 moves on to five chapters devoted to vaccines and vaccine delivery systems, including chapters about human and animal vaccines, Canadian regulation of rabies vaccines, development of oral vaccines for wildlife and

feral animals (with information on both vaccine and bait development strategies), and testing of rabies virus vaccines and then concludes with a chapter on the development of aerial bait distribution strategies.

Part 5 of the book delves into “Data Collection and Diagnostic Methods,” with five chapters addressing topics ranging from laboratory development and basic diagnostic methods to surveillance, collection and transport of specimens, virus typing techniques, and ancillary virologic and immunological methods. This excellent collection of historical and current information on these topics would be of interest to anyone involved in these activities.

One critically important aspect of developing an effective control strategy for any wildlife disease is a clear understanding of the ecology and epizootiology of the disease under study. Part 6 of this book devotes six chapters to those topics. The first four explore what has been learned about the ecology of raccoons, red and arctic foxes, bats, and striped skunks, as well as the effect their ecology has on the epizootiology of the disease in those species. The fifth chapter of this section explores recent advances in the epizootiology of wildlife rabies and describes the data that have informed our understanding of specific variants of the virus, as well as their evolution. The final chapter is titled “Understanding Host Dynamics: Application of Molecular Ecology” and offers a fascinating account of the development of molecular ecology and its use in understanding how host dynamics can influence the prevalence and spread of the disease.

Part 7 moves on to the broad topic of “Prevention and Management of Rabies in Domestic Animals and Humans.” In addition to chapters addressing the history and status of prevention and management efforts, a chapter is devoted to the evolution of communication strategies of the Federal and Provincial governments, with Ontario as an example. This chapter describes the importance and benefits of effective communication not only among Federal and Provincial agencies, but also between those agencies and the public. Failure to communicate adequately with the public can lead to

misconceptions or misinformation and can render the best planned disease control efforts compromised and potentially ineffective. The last chapter in this part of the book is devoted to the cost of rabies management. Clearly, any group involved in the development of a rabies control program needs to understand the myriad of factors feeding the costs of implementing and maintaining the program. The authors' comprehensive evaluation of the multiyear efforts in Canada provides an excellent example of how to assess the costs of a rabies management program.

One might not naturally think about the effect that groups other than scientists can have when it comes to the successful execution of a control program for rabies. Such novel groups are acknowledged for their contributions in Part 8 of the book. The three chapters of this section describe the history of the contributions of the fur-trapping community, the First Nations People, and the Inuit communities and underscore the importance of including such groups in a rabies control program.

Part 9 consists of two chapters, the first of which describes the role of the US Department of Agriculture in wildlife rabies management and its contribution to Canada's efforts. The collaboration between the US and Canada is a great illustration of the importance of—and benefits derived from—the partnership between two countries that share a border. The final chapter of the book is an assessment of the entirety of the program, written by the editors.

In the center of the book is an interesting collection of color plates, including a series of historical maps, a selection of materials used for educating the public, photographs of vaccine production equipment, examples of oral vaccine baits, pictures of fixed-wing airplanes used in aerial baiting efforts, and more.

In summary, *Taking the Bite Out of Rabies* is a unique and comprehensive account of the history of rabies control in Canada. The book chronicles the evolution not only of the program itself, but the progression of the knowledge gained and data obtained in the process. At 600+ pages, it is a long read, and the book has topics of interest for a broader audience than just those directly involved in wildlife rabies control. As such, the authors might want to consider making efforts to reach a broader audience, because the book is a valuable resource not just for those involved in rabies management but also those interested in human or veterinary disease control in general.

#### LITERATURE CITED

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