

BOOK REVIEW

Review of *Pathology of Wildlife and Zoo Animals*, edited by Karen Terio, Denise McAloose, Judy St. Leger. Academic Press. 2018. 1136 pp. ISBN 9780128053065. US \$126.00.

In reviewing this book, I thought that I should introduce myself so that you will have a little context to evaluate my comments. I was trained as a wildlife biologist/ecologist and worked in that field for nearly a decade before becoming a veterinarian. I have been active in wildlife rehabilitation since 1971 and involved in practicing and teaching wildlife veterinary medicine since 1984. I am basically a clinician and wildlife rehabilitator and not a pathologist, although I have more than a passing interest in this area.

As the editors of this book state in their Preface, they have taken on the herculean, almost impossible task of summarizing everything that is known about the pathology of most of the Earth's wildlife species in a single volume. They have done an amazing job! Dr Linda Lowenstine echoes this in her Forward to the book and reminds us that this volume should not be seen as an end in itself but rather as a base that will excite and catalyze future studies in wildlife pathology.

This is a BIG book, weighing in at about 3.3 kgs (7 ¼ lbs). It contains 41 chapters written by 82 people; world-class experts in their respective fields. There is a significant Appendix on "Viral Families and Documented Diseases." The book is not cheap, but it will be a "must have" for many pathologists as well as for clinical veterinarians working with zoos, aquaria, or on wildlife conservation projects.

If one buys the print edition, one gets a very up-to-date resource with numerous color plates. But even more, purchasers get electronic access to the text and to a large number of supplementary tables and digital images (200 whole scanned histology slides) that are not included in the in-print volume. One has to complete a free registration to get this access (yes, you'll have to make up another password); however, for veterinarians and pathologists, it is well worth doing. The quality of images printed in the hardcopy book is very good; however, even so I found that many of the online digital images were sharper.

It is clear from page 1 that the target audience for this book is comparative and veterinary pathologists. When

you take a look at the Table of Contents, your first impression may be that much of this book is not applicable to what US and Canadian rehabilitators do. A large number of chapters focus on species that you are not likely working with (cetaceans, camels, prosimians, or cartilaginous fish, to name a few). Rehabilitators in other parts of the world may find some chapters more applicable to the species they encounter.

When I took my first pathology course, we were taught the Latin phrase *mortui vivos docent*—let the dead teach the living, which is particularly true for wildlife rehabilitation. In our business, a great many animals do not survive, despite our best efforts. If we want to understand how to do a better job, we need to find out what we may have missed in trying to understand an animal's problems, or, equally important, what we may have done wrong that we would like to avoid for the next time. This is where information from necropsies, histopathology and other laboratory studies can be so valuable. In addition, each of our cases tells us something about broader environmental issues, so collecting the best possible data on our patients can be important for understanding and addressing these issues. One can think of examples, such as West Nile virus, lead poisoning, or rabies, where the data and biological samples collected by rehabilitators have played important roles in protecting environmental, animal, and human health.

The majority of rehabilitators may not need to have this book on their shelves for everyday use. It is not a resource that provides many immediate pointers for better animal care. But all the many rehabbers who want to improve their knowledge, develop research projects, or work on publications will want to have access to this excellent volume. The book would make an amazing gift for your collaborating veterinarian, especially if s/he has a particular interest in pathology and if they do necropsies for you. Similarly, if your necropsies are done by a state agency or local university, you will want to make sure that they have this book at hand.

Rehabilitators and the veterinarians with whom they work are always seeking ideas that will help them take better care of their wildlife patients. To that end, I would recommend that everyone take the time to read the first four chapters in this book:

1. Wildlife Necropsy
2. Forensic Wildlife Pathology
3. Laboratory Diagnostics
4. Introduction to Comparative Clinical Pathology.

Correspondence

Mark A. Pokras, B.S., D.V.M., Associate Professor Emeritus, Wildlife Clinic & Center for Conservation Medicine, Cummings School of Veterinary Medicine, Tufts University, N. Grafton, MA, USA.
E-mail: mark.pokras@tufts.edu

These chapters contain a wealth of information that can help all of us better understand and evaluate the range of problems that can happen to the animals in our care. You will probably find yourself pulling out the medical dictionary or looking things up on the web; however, the time and effort will pay off.

If you or your colleagues do your own necropsies, Chapter 1 will help you to do them better. You will learn a great deal about how to document your findings, collect high-quality data and specimens, as well as emphasizing important steps one must take to protect your health and the health of your staff, and other animals in your home and facility.

Chapter 2 on forensics expands upon many of the topics from Chapter 1. It will be particularly valuable for rehabilitators who suspect that wildlife-related crimes may have taken place and are working with state and federal agencies. You will get valuable insights into the CSI side of solving mystery deaths. The chapter also educates rehabilitators on how to keep the records, photos and samples that are very important in both solving and prosecuting crimes involving wildlife.

Chapter 3 is a bit more technical and quantitative but still recommended reading. If you take the time to go through it carefully, it can help you understand how diagnostic scientists think, how best to handle samples that you are sending to labs, how to choose a good lab, and how to better interpret lab results.

Chapter 4 on clinical pathology focuses on testing blood, feces, body fluids, etc. that can be obtained while our patients are still alive (as well as post-mortem) to help us diagnose disease processes. This is another fairly technical chapter, but definitely worth a careful read. When staff at rehabilitation centers are trained, some of these tests can be done with fairly modest lab facilities. However, it is also important for rehabilitators to appreciate the depth of information that can be obtained when samples can be submitted to accredited laboratories for more detailed studies.

Each of the remaining chapters focuses on one or more taxonomic groups, and these chapters are similar in format. After an introduction, there is a description of the unique features of these species, an overview of noninfectious diseases (nutritional, toxic, etc.) and a comprehensive review of infectious diseases. Each chapter reviews in detail the gross and histological findings of each pathological condition. This approach is most useful for readers interested in specific species (e.g., felids or passerine birds). However,

readers seeking detailed reviews of specific pathologic problems (e.g., salmonellosis, pox virus, lead poisoning) will find such information spread among many of the taxonomic chapters. This means that for such topics, there is a certain amount of repetition among chapters.

Although it should be clear that I really like this publication, it does have a couple of weaknesses that are common in modern scientific books. One is that the index could be more thorough. There are topics or keywords in the text that are not found in the index. Luckily, if you have access to the electronic version of the book, you can use a variety of search tools to find what you are seeking. Second, although I did not do an exhaustive search, there were some citations in the text for which I was unable to find complete references.

In closing, I hope that when you look at this book, you will be in awe. It represents an amazing amount of hard work and scholarship. But do not let this achievement (or some of the big words) intimidate you. Be inspired! There is SO much we do not know about the health and pathology of our native species. This means that there are unlimited opportunities for rehabilitators to work more closely with pathologists. Please take this book review as a stimulus to send in more samples for testing, and more mystery deaths for necropsies. Take every opportunity to get to know pathologists in your area and build professional linkages.

Of course, it costs money to do pathology and other laboratory studies. However, if rehabilitators and veterinarians are going to improve our skills and do a better job for the animals that come into our care, it is imperative that we get more accurate information on all these wildlife health issues.

If we are persistent and imaginative, there can be opportunities to do focused fund-raising for these activities, including becoming involved in research grants. We may be able to give wonderful support to a patient with neurological disease. However, unless we can find out if the cause was viral, bacterial, fungal, toxic, trauma or something else, how can we tell what to do differently next time?

Let me encourage you all to divert a little more of your scarce resources towards pathology. It is relatively inexpensive for the information you get back, and it can help us all help more animals in the long run.

Check out this book and see if it does not fire up your enthusiasm, too!