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# PATHOGEN EMERGENCE IN THE AGE OF PANDEMICS

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## PATHOGEN EMERGENCE IN THE AGE OF PANDEMICS

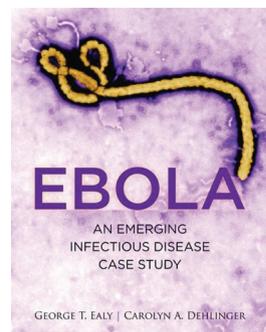
**Ebola: An Emerging Infectious Disease Case Study.** George Ealy and Carolyn A. Dehlinger. Jones and Bartlett Learning, 2015. 148 pp., illus. \$29.95 (ISBN: 1284087786 paper).

**Pandemic: Tracking Contagions, from Cholera to Ebola and Beyond.** Sonia Shah. Sarah Crichton Books, 2016. 228 pp., illus. \$26.00 (ISBN: 0374122881 cloth).

The emergence of novel or previously rare pathogens is not new. Throughout recorded history, catastrophic mortality has followed the arrival of new infectious diseases to areas that had no previous experience with the offending agent. The second plague pandemic, more commonly known as the Black Death, was caused by a bacterium that originated in China but then spread throughout Asia, Europe, and Africa via the Silk Road and other routes of commerce. The emergence of rinderpest in Africa, associated with Asian cattle imported by European colonists, killed millions of domestic livestock and wild animal species in the 1890s. The result was widespread starvation—reports from Tanzania alone suggest that more than 60 percent of Maasai people died—the collapse of existing economic institutions, and long-term ecological changes associated with the loss of grazing animals. Transmission of chikungunya virus and Zika virus,

two pathogens that are transmitted to people by mosquitoes, have recently been documented for the first time in the Western Hemisphere. Although pathogen emergence is not new, it remains a fascinating and terrifying topic. Recent emergence events have led to a wealth of books on the subject.

No recent emergence event was in the public eye more than the 2013–2016 Ebola virus outbreaks in West Africa. George Ealy and Carolyn Dehlinger cover this outbreak in *Ebola: An Emerging Infectious Disease Case Study*. Ealy and Dehlinger are both professors at Keiser University in Florida, and this book is designed for an introductory-level seminar or recitation, although it could also complement a traditional textbook in a virology or public health class. The text exposes readers to basic principles of virology and epidemiology by embedding those principles in an overview of the Ebola outbreak and response that began in 2013. The approach is sound, because traditionally uninteresting topics are given a fresh patina when discussed in relation to Ebola. Although this approach would likely help generate student interest, the diverse range of topics covered, from analytical epidemiology to negative-sense RNA replication, allows only a superficial treatment of the information within. This is one reason why this book would potentially pair well with a more exhaustive text in a classroom setting.



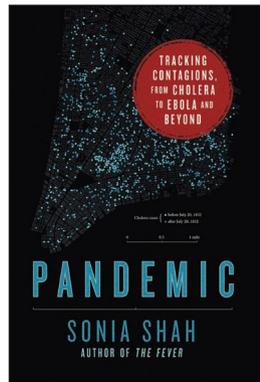
Ealy and Dehlinger begin by delving into the natural history of Ebola virus,

including a brief discussion on how to identify an index case during a disease outbreak. Subsequent chapters cover basic epidemiological principles, diagnostic tests, the development of Ebola drug treatments, government policies in the face of a pandemic, and coverage of other potential pandemic threats. Embedded within these chapters are brief forays into timely topics, including using social media to track disease outbreaks. Each chapter begins with a set of topics or questions to consider while reading, such as “point out the differences and the similarities between incidence and prevalence of a disease.” There are also critical-thinking questions at the end of each chapter, which could help structure a classroom discussion. Ealy and Dehlinger also make extensive use of figures, tables, and photographs. Almost every page has at least one image, text box, or illustration. Keywords are defined throughout, and there are also resources at the end, including a glossary, a list of references, and an index.

This book obviously required a great deal of effort to put together. It was published in the fall of 2015, while many of these events were still unfolding, so it was also likely put together very quickly. There are mistakes throughout the book that range from missing punctuation to incorrect mosquito taxonomy. And although the liberal use of figures and tables is good for students, some tables added more confusion than clarity because of incomplete descriptions. Figures could also be a hindrance when they did not align with the topic of the sentence in which they were referenced.

Authorship of each chapter alternates, with Ealy writing one chapter and Dehlinger the next. The result is text that is occasionally disjointed and often repetitious. The humanitarian group Doctors Without Borders (Médecins Sans Frontières) is both defined and described at least three separate times. An entire chapter is dedicated to antiviral agents and vaccines, but these topics are covered again, albeit much more briefly, in a subsequent chapter. The problems associated with

grammatical mistakes, repetition, and citations could easily be remedied in future versions, but other issues are more persistent. Slim textbooks often struggle to present material in a logical order, because the reader must understand certain concepts before they can delve into the next. They also struggle to provide enough detail to be both accurate and informative. This text is no exception. Very early in the book, in a section on Ebola emergence, the authors state that “reliance on healers, traditional funeral practices, and the practice of eating wild animal meat also contributed to the outbreak. Increasing contact between humans and the suspected animal reservoir (fruit bats) led to the phenomenon of zoonotic spillover—also a contributing factor. Climate changes affect the growth of fruit trees from which the bats feed.” Covering this many topics in such a condensed approach offers only a thin veneer of information. Despite these shortcomings, the topic is engaging and the writing compelling at times. It could be a useful addition to the right classroom setting.



*Pandemic* by Sonia Shah also shines light on disease emergence events, but instead of focusing on a single pathogen, as Ealy and Dehlinger do, she traces the emergence of all manner of contagions. Shah is an investigative journalist and author whose previous works include *Crude*, about the history of oil, and *The Body Hunters*, which focuses on how biopharmaceutical companies often test novel drugs in extremely poor segments of the world's population. Shah anchors her book

with cholera, an infection caused by the bacterium *Vibrio cholera*. Cholera has been devastating to human populations throughout history, and it is still responsible for tens of thousands of deaths every year. The author states that “the disease-causing microbe, or pathogen, that will cause the world's next pandemic lurks among us today” and “that it will likely follow the path that cholera blazed.”

The title of the first chapter is “Jump,” and it covers how pathogens jump from one species to another or how certain situations provide opportunities for these host-switching events to occur. Subsequent chapters are similarly titled. “Filth” details the links among pandemics, sewage systems (or lack thereof), and human and animal waste. “Corruption” examines how preventing disease outbreaks is often at odds with an individual or company's bottom line. Although the topics are disparate, there are unifying threads that make appearances throughout the book. One is the continual return to cholera. Another is the author's own story on methicillin-resistant *Staphylococcus aureus* (MRSA) and how it made an unwelcome appearance in her family and then continued to show up periodically for years.

This is an excellent book. Although some of the stories have been well documented in the past (like the 2003 monkey pox outbreak in the United States), they are given new life in this text because Shah is such a skilled narrator. Other topics are more obscure. In a section on the history of quarantine, the author details how “an army of soldiers in a twenty-mile-wide formation that stretched... across the Balkans, with orders to shoot on sight any passersby who failed to submit to quarantine—held the plague out of Turkey in the eighteenth century.” There is also a detailed story about how the Manhattan Company (which would later become JPMorgan Chase) knowingly distributed contaminated groundwater to New York City for years, exacerbating cholera

outbreaks. Alexander Hamilton called the Manhattan Company “a perfect monster in its principles,” which led the company’s founder, Aaron Burr, to challenge Hamilton to a duel. The outcome is well known. Shah’s background in investigative journalism serves her well when embedding these historical events in discussions of what we now understand about pandemics. Interspersed among these stories are discussions of  $R_0$  (the mathematical term that describes the transmission potential of a pathogen) and other complex scientific topics that Shah makes easily accessible.

At times, the tenor of the book does come across as alarmist. Given the subject matter, this is not unexpected, especially considering that many of the subjects this book covers—such as how the activities of the World Health Organization are now driven by donor interests rather than by global health needs—truly are alarming. Although the number of pathogen emergence events is alarming and does appear to be on the rise, our ability to detect new pathogens is also unprecedented, so some of this increase is confounded by scientific advances that make detection more likely. There are also sections that fall short, or at least sections that are not fleshed out enough to encompass the nuances needed to be scientifically accurate. A paragraph stating that high avian biodiversity in the United States acted as a barrier to West Nile virus introduction does not have sufficient citations to justify such a broad statement. A discussion in the chapter “The logic of pandemics” states that females choose males with high levels of testosterone because the hormone correlates with stronger immune defenses, but this is not necessarily true; testosterone is known to be immunosuppressive.

However, these are minor quibbles, and overall, this book offers a well-paced read that is superbly written. Shah weaves contemporary scientific

information with disease outbreaks from the past. The result is a fascinating account of human pandemics.

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