Evolution and Medicine

by Robert L Perlman

reviewed by Wenda Trevathan

Robert Perlman’s book on evolution and medicine is the most recent of a series of books that Oxford University Press has published on the rapidly evolving field of evolutionary or Darwinian medicine. It consists of eleven chapters covering topics ranging from cystic fibrosis to what he calls “man-made diseases” such as diabetes, hypertension, and obesity. The book targets a scientifically literate audience including clinicians, medical students, and biomedical researchers. Its appeal to an interested lay audience is limited by its technical discussions of genetics, life history tradeoffs, and host-pathogen coevolution, although a general reader desiring information on the most recent thinking on a number of the subjects of evolutionary medicine may find it worthwhile to consult certain sections. The academic style of writing is not likely to appeal to those simply interested in getting a sense of what evolutionary medicine is all about. As such, this book is in line with other more scholarly works on the subject.

In the first chapter, Perlman provides an overview of the theory of evolution by natural selection, aspects of our evolutionary history that have made us vulnerable to so many diseases, and why medical thinking and evolutionary thinking may be at odds with each other today. For example, clinicians and their patients may view evolutionary trade-offs as problems to be solved in individuals with medical interventions, whereas the evolutionary medicine view is that some of these tradeoffs may result from natural selection to optimize fitness in a species or population. This divergence in focus of attention (on the individuals for clinicians and on the species or population for evolution scholars) is one of the fundamental differences between the two ways of viewing health and disease. The two interests converge in at least one area: an understanding of host–pathogen coevolution is necessary to slow the spread of antibiotic resistance and to develop strategies to reduce the spread of infectious diseases that affect individuals and species.

The second chapter, on demography in human populations, is a welcome addition to the literature on evolutionary medicine. Demography is not usually emphasized in other scholarly works on the subject. Given that evolution is about survival and fertility, a clear discussion of population structure and factors affecting fertility is important. In this chapter is a well-considered argument that limiting fertility in favor (often) of greater socioeconomic success may actually be maladaptive from an evolutionary viewpoint. Perlman suggests that fertility limitation may be a mismatch between our evolved psychology and our contemporary environments.

The third chapter, on evolutionary genetics, is an important update on recent research and thinking on processes of evolution, genetic dominance, pleiotropy, epistasis, epigenesis,
Hardy–Weinberg equilibrium, and other complex concepts in the field of genetics. This is the chapter that may require the casual reader to stay close to a dictionary of scientific terms. But for the scholar already familiar with the vocabulary, it serves as a good refresher text as well as an introduction to some interesting new work.

In his fourth chapter, Perlman provides an evolutionary medicine perspective on cystic fibrosis and the phenotypes and genotypes associated with it. There are a number of diseases that for a long time appeared to be inherited as recessive Mendelian traits and have been called “inborn errors of metabolism.” Cystic fibrosis is one of these and serves as an illustration of how complex-disease-causing alleles can be maintained at somewhat high frequencies in human populations. Not surprisingly, the gene and its associated by-products are not as simple as we remember from basic genetics textbooks. Perlman discusses this complexity and the various theories that purport to explain why deleterious genes are maintained in somewhat high frequencies, even when pre-reproductive mortality was high in the past.

Chapter 5 provides an overview of life history tradeoffs and the biology of getting older. It includes an overview of ways in which evolutionary theory has dealt with aging, reviewing causes of degenerative aspects of aging ranging from genetics to developmental origins. Particular attention is given to aspects of aging that have been shaped by life history tradeoffs. Unlike many discussions of these topics, Perlman's treatment provides details on the likely mechanisms that mediate these tradeoffs and offers a critique of some of the more speculative proposals that have been offered. One of the most feared categories of diseases of aging is cancer, the topic covered in chapter 6. A primer on cell growth and replication, both normal and abnormal, forms part of this chapter, which offers a view of cancer development resulting from natural selection. Examples of genes that may be subject to natural selection include oncogenes and tumor-suppressor genes. An evolutionary understanding of cancer leads to the conclusion that it will probably not be eliminated in the future: medical research efforts would be better spent on prevention measures, especially those that reduce exposure to cancer-causing agents.

The aspect of evolutionary medicine that has been best received by the medical community and the general public concerns host–pathogen coevolution, the subject of chapter 7. This is the familiar “arms race” that leads hosts to minimize fitness costs of pathogens and pathogens to optimize their own fitness. As in previous chapters, Perlman provides technical details here that move beyond simple discussions of the future of antibiotic resistance.

The final chapters cover sexually transmitted diseases (with emphasis on syphilis and HIV), malaria, and lactase persistence. All three topics are discussed with up-to-date information and technical detail that make the book an excellent resource for anyone interested in getting current information in addition to the evolutionary perspective. The final chapter is a consideration of the topic that forms the core of much of the popular writing on evolutionary medicine: the mismatch between our evolved bodies and the lives we currently live, the result of which is an assortment of health challenges of modernization such as obesity, diabetes, hypertension, and allergies.

In summary, Robert Perlman’s *Evolution and Medicine* is packed with technical details, current research, and important discussions of a number of areas of concern in evolution-
ary medicine. It is not an easy read, however, and potential readers must be prepared to pay attention. It is an excellent resource for those desiring to understand evolutionary medicine beyond the more generalized and popular writings and will be especially useful to physicians and medical students.

ABOUT THE AUTHOR

Wenda Trevathan is Regents Professor Emerita in the Department of Anthropology at New Mexico State University. Her research concerns aspects of human reproduction including childbirth, maternal behavior, sexuality, menopause, and evolutionary medicine. Her most recent book is *Ancient Bodies, Modern Lives: How Evolution Has Shaped Women’s Health* (New York: Oxford University Press, 2010).

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