

Dyspnea: Mechanisms, Measurement, and Management, 2nd edition. Donald A Mahler and Denis E O'Donnell, editors. *Lung Biology in Health and Disease* series, volume 208. Claude Lenfant, executive editor. Boca Raton, Florida: Taylor & Francis. 2005. Hard cover, illustrated, 472 pages, \$199.95.

Respiratory care is a technologically intensive endeavor in which we easily become preoccupied with formulas and processes as we attempt to correct derangements in our patients' gas exchange and pulmonary mechanics. As a result, we sometimes lose sight of the fact that the subjective experiences of dyspnea (difficulty in breathing) and breathlessness (the unpleasant sensation of an urge to breathe) are the principal concerns of our patients. I was reminded of this preoccupation when I happened to come across the following quote: "There is something more terrifying than pain, and that is the inability to breathe."¹

What grabbed my attention was that this *matter-of-fact* comment came from a Uruguayan army interrogator discussing "el submarino" or "water-boarding," an especially effective torture technique, in which the prisoner is repeatedly submerged under water until he begins to drown. Particularly unsettling to me was the fact that practitioners of this nefarious art clearly understand what sometimes escapes our focus: that the act of breathing is *the* primal sensation of life; the disturbance of which produces the most profound sense of dread.

In preparing this review I did a PubMed search, separately using the title words "dyspnea" and "breathlessness." Since 1965 there have been 2,182 publications in the peer-reviewed literature of which 186 have been clinical trials. Research on dyspnea and breathlessness began in earnest only in the past 25 years, as approximately 85% of all published reports have appeared since 1980. Yet, the topics of dyspnea and breathlessness have received little attention in the respiratory care literature. In reviewing the subject index of RESPIRATORY CARE journal from the years 1974 to 2004 I found that only 9 papers related to dyspnea have been published. Similarly, respiratory care textbooks typically devote only a few sentences to dyspnea, and sometimes a couple of paragraphs scattered throughout the book. The

exceptions to this are textbooks specifically devoted to pulmonary rehabilitation.

The paucity of information on dyspnea and breathlessness is puzzling in a profession that is devoted to alleviating these symptoms. I think part of the explanation is that our profession was emerging at a time when little was known about the psychological and physiological mechanisms responsible for the sensations of dyspnea and breathlessness. Therefore, those writing respiratory care textbooks probably felt no particular need to devote much space to the topic. In addition, what makes dyspnea and breathlessness so intriguing is their inherent complexity and nuance. Thus, from a pedagogical standpoint, an in-depth discussion of dyspnea may not be conceptually appropriate for students struggling to grasp the fundamentals of respiratory physiology and pathophysiology. Nonetheless, as a maturing profession we need to move toward a more profound understanding of this important symptom.

Fortunately, a wonderful and comprehensive source has just been released. **Dyspnea: Mechanisms, Measurement, and Management** was edited by Donald Mahler and Denis O'Donnell, 2 preeminent investigators in the field, and is part of the excellent series *Lung Biology in Health and Disease* (Claude Lenfant, executive editor). The book contains 18 chapters, spanning 471 pages, and, as the title suggests, can be divided into 3 distinct sections: mechanism, measurement, and management. It begins with 2 chapters discussing the history of dyspnea and the phenomenon of dyspnea as it relates to the process of aging. Chapters 3 through 5 describe the mechanisms of dyspnea in the 3 major groups of patients who suffer from the symptom: those with chronic obstructive pulmonary disease, asthma, and chronic restrictive lung disease. Chapter 6 is particularly interesting, as it focuses on the language used by patients to describe dyspnea, its relationship to the underlying pathophysiologic disturbances, and the importance of vocabulary on the study of dyspnea. This chapter also provides a graceful transition from the topic of mechanism to that of measurement.

Chapter 7 reviews the issues surrounding the measurement of dyspnea in the clinical setting, and Chapter 8 describes

the issues of provoking and measuring dyspnea in the laboratory setting. A separate chapter is devoted to the important issue of how dyspnea should be assessed in large-scale clinical trials. Chapter 10 deals with the particularly troubling issue of evaluating cases of "unexplained dyspnea," which necessarily sharpens the focus onto the patient. Again this provides a smooth transition from measurement to management.

Chapter 11 is an extensive review of assessing dyspnea in the context of quantifying health status and assessing the general issues of quality of life. The role of bronchodilators and inhaled corticosteroids in the treatment of dyspnea is described in Chapter 12, whereas a comprehensive review of the role of pulmonary rehabilitation programs on the treatment of dyspnea is covered in Chapter 13. Specific topics such as the role of inspiratory muscle training, oxygen therapy, coping and self-management strategies, and lung-volume-reduction surgery are presented in Chapters 14–17. The final chapter discusses the management of dyspnea in palliative care.

Although the writing is direct and each chapter is well organized, the content sometimes can be very densely detailed, as when psychophysics is discussed. **Dyspnea: Mechanisms, Measurement and Management** is geared primarily toward physicians and clinical scientists, and thus is not readily accessible to students. The exceptions would be the chapters "Language of Dyspnea" and "Coping and Self-Management Strategies for Dyspnea," which should be required reading for all respiratory care students. Overall, I think educators will find this book to be a useful resource for abstracting general concepts regarding dyspnea, which then could be reformulated to a level appropriate for students. Experienced respiratory care clinicians, particularly those specializing in rehabilitation and long-term care, seeking an in-depth understanding of dyspnea in different settings will find this book highly useful. Like other volumes in the *Lung Biology in Health and Disease* series, **Dyspnea: Mechanisms, Measurement and Management** is a hard-cover book with a sturdy, woven binding, using high grade pa-

per. This volume should be a welcome addition to anyone's medical library.

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REFERENCE

1. Quotation from an unidentified Uruguayan army interrogator, in Danner M. Abu Gh-raib: the hidden story. *The New York Review of Books*, October 7th, 2004;LI(15): 46. http://www.markdanner.com/nyreview/100704_abu.htm. Accessed December 20, 2005.

Bioterrorism: A Guide for Hospital Preparedness. Joseph R Masci MD and Elizabeth Bass. Boca Raton, Florida: CRC Press. 2005. Hard cover, illustrated, 361 pages, \$129.95.

Bioterrorism: A Guide for Hospital Preparedness is a timely and practical text regarding the threat of and response to bioterrorism. The book has 5 sections. Section I, "The Scope of the Problem," briefly reviews the history of bioterrorist attacks around the world, the sources of biologic agents, and the groups most likely to use them. A particularly cogent discussion of the social and economic costs of bioterrorism, which addresses the anthrax event of 2001, is important reading for all those involved in hospital preparedness. A subsection called "Trends in Terrorism" is a sobering review of the threat we face from murdering extremists from various backgrounds. The role of the United States public health system is reviewed, as are the results of the TOPOFF 2 ("Top Officials") mass-terrorism-casualty-care exercise conducted in May of 2003. Critical findings of the exercise were: (1) communications were inadequate and overwhelmed, (2) staff shortages were critical, and (3) means for isolating contaminated/infectious subjects were in short supply. This section devotes a third of a page to the "Strategic National Stockpile," but, unfortunately, mentions little about ventilator supplies.

Section II, "Improving Hospital Readiness and Response," is a concise and important review of how hospitals and communities can better prepare for bioterrorism. This preparation includes the creation of a "hospital emergency-incident command system" and the use of infection-control pro-

cedures. A point that is stressed throughout the book is the importance of effective communication, coordination, and control. Without effective communication, all the equipment in the world is useless in a mass casualty event. The authors point out the need to protect the caregivers from secondary contamination and the role of personal-protection equipment. This section is the strength of the text; it covers staff education, psychological effects, managing stress in caregivers, and communicating with the media. There are also some very helpful, simple questions and answers for the lay public.

Section III, "Prevention, Diagnosis, and Treatment of Likely Biological Agents," provides a brief overview of the agents likely to be used in a bioterrorist attack. Each agent is reviewed in a consistent format, which enhances readability and allows easy comparison. For the novice this is great information. For the clinician with experience and/or background in bioterrorism, this is a cursory review. A particularly helpful section about the effects on children is provided, and the chapter on Internet sources of information is helpful. Many of the links provided remain active, although a few are no longer accessible.

The final 2 sections, "Tabletop Exercises" and the appendixes section, are excellent sources of information and helpful in designing a program to educate, train, and evaluate staff. These sections provide real-world scenarios and exercises with answers.

This text is clearly intended for individuals responsible for hospital preparedness. I would recommend the book for those individuals without question. For respiratory therapists, nurses, and physicians who care for patients on a daily basis the information provided is a good overview of the important issues in bioterrorism. Having said that, clinicians should check it out of the library, not buy it.

This book was written by a husband-and-wife team, consisting of a physician and a journalist, and I think the text is readable and gives a wealth of information. Both the authors have expertise in the arena of bioterrorism. The book is well organized into bite-size chunks that can be readily digested. The illustrations are adequate, but few and far-between. Some photographs of the lesions associated with specific biologic agents would have been instructive. The cited references are current, and the index is effective.

This text can provide the hospital disaster preparedness committee with a wealth of information and helpful advice. The focus is narrow but appropriate and, in light of recent events, particularly topical.

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SARS: A Case Study in Emerging Infections. Angela R McLean, Robert M May, John Pattison, and Robin A Weiss, editors. New York: Oxford University Press. 2005. Soft cover, illustrated, 133 pages, \$39.50.

The emergence of severe acute respiratory syndrome (SARS) presented a challenge to public health and health-care delivery systems worldwide. SARS was a previously unknown respiratory syndrome, characterized by nonspecific clinical symptoms, was highly transmissible in some circumstances, did not respond to antimicrobial therapy, and could rapidly progress to severe respiratory distress and death. SARS appears to have originated in Guangdong Province, China, but the global importance of this illness was not recognized initially by local health authorities.

When the World Health Organization issued a historic global alert about cases of severe atypical pneumonia on March 12, 2003, the outbreak had spread via international travelers from Guangdong Province to at least Hong Kong, Hanoi, Singapore, and Toronto. The sudden appearance and rapid spread of the virus alerted the world to the fact that emerging infections are a global problem. There was an urgent global need for diagnosis of the etiologic agent; detection and containment of probable cases; guidance on the health-care management of patients and potentially exposed persons; identification of measures to prevent and control infections; and timely public-health communications to a wide range of audiences. Living in an affluent society with a well-developed health-care system does not necessarily protect a person from such a life-threatening infections.

Although the United States was not as severely affected by the SARS epidemic as parts of Asia and Canada, the outbreak response demonstrated both known and unexpected strengths and weaknesses in United States national, state, and local public-health and health-care capacities to address major infectious-disease challenges. As of April

26, 2004, in the United States only 8 persons were laboratory-confirmed as SARS cases. There were no SARS-related deaths in the United States. All of the 8 persons with laboratory-confirmed SARS had traveled to areas where SARS coronavirus (SARS-CoV) transmission was occurring.

The SARS epidemic tested global preparedness for dealing with a new infectious agent and raised 2 important questions: how did we do, and what did we learn? This book uses the SARS outbreak as a case study to enumerate the generic issues that must be considered when planning the control of emerging infections. Emerging infections are more than just a current biological fashion: the bitter ongoing experience of acquired immune deficiency syndrome (AIDS) and the looming possibility of pandemic influenza highlight that the control of infectious disease is a problem we have not yet solved.

The SARS experience, however, made one lesson clear early in its course: inadequate surveillance and response capacity in a single country can endanger national populations and the public health security of the entire world. Policy makers and scientists from various disciplines, including biologists, veterinarians, and physicians, need to prepare. This book provides an up-to-date and accessible overview of the tasks a community must address to deal with emerging infections.

The book is organized into 15 chapters. The introductory chapter emphasizes why we have to learn about SARS and other emerging infections. The following 3 chapters compose a "horizon-scanning" section. Chapter 2, by McMichael, states the influence of environmental and social factors on emerging infectious diseases. The contemporary spread and increased liability of various infectious diseases reflect the combined and increasingly widespread impact of demographic, commercial, environmental, behavioral, technologic, and other changes. Chapter 3 addresses the evolutionary genetics and emergence of SARS-CoV. The study of viral evolutionary genetics is crucial to understanding fundamental aspects of virus emergence. Chapter 4, by Bush (of the Ecology and Evolutionary Biology Department at University of California), uses influenza as a model system for studying the cross-species transfer and evolution of SARS-CoV.

Chapter 5, by Zhong and Zeng, describes the early outbreak of SARS in late 2002,

from Guangdong Province to Hong Kong and over 25 countries across 5 continents within a few weeks. Chapter 6, by Peiris and Guan, addresses Hong Kong's experience with SARS. The pattern of disease emergence and Hong Kong's SARS-control strategies provide lessons for coping with future emerging infectious-disease threats. Chapter 7, by Osterhaus et al, describes how Koch's postulates were used to prove that the newly identified coronavirus is the etiology of SARS.

Chapter 8, by Zambon et al, describes the development of molecular and serologic diagnostic tools for laboratory diagnosis of SARS. Serologic and nucleic-acid assays to detect SARS-CoV infection and virus, respectively, were developed early in the outbreak investigation. Comparative studies have now confirmed the sensitivity and specificity of enzyme-linked immunosorbent assays for detecting SARS antibodies, and of multi-targeted real-time reverse-transcription-polymerase-chain-reaction assays for detecting SARS-CoV infection. Although these assays are sensitive for detecting antibody and viral ribonucleic acid, they are of limited help in diagnosing SARS early in the course of disease. However, since the SARS clinical case definition is nonspecific and therefore can capture respiratory illness caused by other pathogens (eg, *Mycoplasma pneumoniae* and influenza), laboratory confirmation of SARS-CoV infection is particularly important for focusing control efforts during an outbreak and for refining SARS clinical studies. The link between wild animals (especially civet) and SARS-CoV is well established.

Chapter 9, by Bell et al, discusses the impact of the international trade in wildlife used for food, and raises important questions about how that trade can be monitored and controlled. Chapter 10, by Anderson et al, addresses the need to understand the epidemiology and transmission of diseases, to design effective control measures. By quantifying the relationship between time-to-infectiousness and time-to-disease we can classify infections into those that can and cannot be controlled by case isolation. The spread of SARS dramatically illustrated the role of global air travel in transmission of newly emerging infection all across the world. The use of the most effective infection-control practices in air travel is paramount.

Chapter 11, by Brockmann et al, presents the use of new probabilistic mathe-

matical models to predict the intercontinental transfer of infections and the impact of various interventions. Chapter 12, by Heymann, the former executive director of communicable disease of World Health Organization, describes preparedness issues and international response to the SARS outbreak. The World Health Organization's role in coordinating the global response to SARS was very important to interruption of the global outbreak by July 2003. The rapid spread of a new transmissible disease causes substantial psychological stress on health-care workers. In Singapore, Canada, and Vietnam the disease was transmitted to many hospital workers by ill travelers and contacts of ill travelers, but it was successfully contained within hospitals. Where the disease was not rapidly controlled in health-care settings, as occurred in China, Taiwan, and Hong Kong, it spread into the community, resulting in extensive disease transmission.

Chapter 13, by Maunder et al, discusses the experience of Mount Sinai Hospital in Toronto, including coping with the stress among front-line health-care workers. The prompt use of isolation/quarantine and infection-control procedures was key.

Chapter 14, by O'Neill, discusses the matter of individual freedom in a society threatened with an infectious disease that can only be controlled by quarantine. It was easier to manage the SARS epidemic in a more controlled society, such as China, than in more individualistic, liberal democracies.

Chapter 15 summarizes what we have learned about SARS and how it differs from influenza. The SARS outbreak has been controlled, and there were 8,098 cases of illness and 774 people died. While the book focuses on SARS, it also addresses various related considerations and issues, such as the use of mathematical models of the spread of infection across global airline networks and the ethics of quarantining individuals to protect communities.

Who will gain by looking into this book? I think it will be of value to students, academicians, and policy-makers in the fields of disease ecology, medicine, and public health, and undoubtedly for respiratory care physicians and respiratory therapists. Changes in human ecology and behavior are important factors in the development of a newly transmissible disease, and whether SARS will reappear is unknown; the public-health and health-care communities must be prepared for the possibility. This book

will help you understand what to do when facing a new transmissible disease. I recommend this book as a valuable addition to departmental and personal libraries.

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The Microbe-Host Interface in Respiratory Tract Infections. Jan LL Kimpen and Octavio Ramilo, editors. Wymondham, Norfolk, United Kingdom: Horizon Bioscience. 2005. Hard cover, illustrated, 323 pages, \$139.95.

This book addresses the complex and fascinating topic of host-pathogen interactions and their respective roles in the pathogenesis of pulmonary infectious diseases. The book includes 13 chapters, written primarily by Dutch physician-scientists with active research programs in the field of pediatric infectious diseases. Although variable in length, the chapters are generally well-written, up to date, and well-referenced. However, because the book was written primarily from a pediatric perspective, very little information is included regarding adult infectious diseases. Much of the content is pediatric-specific, with marginal relevance to common pulmonary infectious syndromes in adults.

Noteworthy chapters include the first two in the book. Chapter 1, "Relevance of Genetic Background in Respiratory Tract Infections," provides an interesting and relatively comprehensive overview of host immunogenetics in respiratory tract infection. Chapter 2, "The Hygiene Hypothesis: The Role of Microbes in the Prevention of Atopy and Atopic Disease," presents an interesting discussion of the hygiene hypothesis of allergic disease, with implications further explored in Chapter 11, "Viral Infections and Childhood Asthma."

Chapter 9, which addresses the role of vaccines in the prevention of respiratory tract infections, provides an interesting discussion of the pneumococcal vaccine and the potential problems inherent in vaccination strategies for other bacterial and viral respiratory pathogens.

The overall appeal of this book is diminished by a number of curious omissions and deficiencies. Despite the well-recognized

and critical role of dendritic cells in the host response to pulmonary pathogens, the term "dendritic cell" is not in the index, and dendritic cells are not specifically discussed in the text. Influenza, despite its obvious overall importance as a viral respiratory pathogen, receives scant attention. This deficiency is especially puzzling, given the inclusion of specific chapters devoted exclusively to adenovirus and rhinovirus. Likewise, tuberculosis receives relatively minor attention in this book, despite the worldwide importance of *Mycobacterium tuberculosis* as a pulmonary pathogen and the amount of scientific interest in host response to *M. tuberculosis*. The book does not include a chapter on the microbe-host interface in chronic obstructive pulmonary disease, which perhaps reflects the editors' pediatric focus. Similarly, bronchiectasis is not discussed outside of the context of cystic fibrosis.

On the back cover, the book touts itself as "essential reading for all scientists and medical professionals involved in this field." In my opinion, this self-assessment is a bit of an overstatement. The primary audience should be investigators of pediatric infectious diseases who want a contemporary, focused review on one of the topics covered. However, other texts, such as *Immunology, Infection, and Immunity*, edited by Pier et al, may better serve this purpose. Scientific investigators in the field are far more likely to rely on original manuscripts and contemporary reviews published in peer-reviewed journals.

Most of the chapters have insufficient information to guide clinical decision making. For clinical reference, health-care providers would be better served by relying on comprehensive textbooks such as *Principles and Practice of Infectious Diseases*, 6th edition, edited by Mandell et al, or condensed textbooks such as *Infectious Diseases: The Clinician's Guide to Diagnosis, Treatment, and Prevention*, edited by Dale. Comparable textbooks in pediatric infectious diseases are available. Online resources, such as *UpToDate*, also provide more appropriate information for health-care practitioners than is covered in **The Microbe-Host Interface in Respiratory Tract Infections**.

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New Perspectives in Monitoring Lung Inflammation: Analysis of Exhaled Breath Condensate. Paolo Montuschi MD, editor. Boca Raton, Florida: CRC Press. 2005. Hard cover, illustrated, 218 pages, \$119.95.

Exhaled breath condensate (EBC) has been more and more extensively used as a novel and noninvasive method to study airway inflammation. It is simple to perform, is very well tolerated by patients, and no adverse events have been reported so far. Serial measurements can be made with no harmful effects on patients, which is of extreme value in medicine. EBC has been obtained from both adults and children suffering from various pulmonary diseases, such as asthma, cystic fibrosis, chronic obstructive pulmonary disease, and interstitial lung diseases. Several markers and mediators are detectable in EBC: hydrogen peroxide, thiobarbituric acid-reactive substances, isoprostanes, prostaglandins, and leukotrienes. Nitric oxide-related markers have also been studied in EBC. There is increasing evidence that the changes in content of markers found in EBC reflect local abnormalities of airway-lining fluid.

I started reviewing this book with the conviction that the task was going to be "homework" that I did not really feel like doing, but I soon realized it was to be a completely different story, as I found the book interesting and stimulating. It is very well written and easy to read. It covers almost all the current knowledge on what EBC is, where it comes from, the technical aspects of EBC collection, the clinical aspects of EBC, et cetera.

The book is intended to provide a comprehensive view of EBC for all interested in pulmonary medicine: physicians and researchers in the field.

The table of contents provides a detailed guide to the structure of the book. The arrangement of headings is carried into the text chapters, and each chapter begins with an exceptionally precise list of subheadings that emphasize each aspect of the described topics.

The book starts with an excellent chapter on a new EBC approach to monitoring lung inflammation. It describes the general idea of how EBC has broadened the spectrum of available tools to study lung diseases in vivo. Until EBC, in vivo studies were limited by the invasive nature of obtaining samples from within the lung (eg, bronchoalveolar lavage, biopsy, sputum collection). The chapter also predicts future EBC develop-

ments and indicates how EBC might have great potential, though it is also admitted that far more information is needed to make reliable and reproducible EBC measurements.

Chapter 2 addresses methodological issues, and all the issues are presented concisely and with great clarity. Chapter 3 discusses the formation and physicochemical properties of EBC. The chapter emphasizes that clarification of the methodological issues is the main priority of the current research. It also discusses future research needs, such as the identification of reference values and studies on formation of EBC, its origin in the respiratory tract, and its relationship with airway-lining fluid.

Chapters 4 through 10 cover inflammation markers in respiratory-tract diseases. This is a particularly important and interesting topic, and the markers are carefully and completely analyzed and discussed. Chapter 4 has an excellent section on eico-

sanoids in EBC in various inflammatory lung diseases. Each chapter ends with a clear and informative summary, which I think will be extremely helpful for readers.

One of the strongest parts of the book is the chapter on the analyses of EBC from children. This topic is presented with its full complexity, but with great clarity. Because of its noninvasive character and the general lack of other appropriate techniques to characterize airway inflammation in children, EBC is particularly interesting for pediatric respiratory medicine. EBC is a simple, safe, and feasible method for sampling inflammatory mediators from the respiratory tract in children ≥ 4 years old.

In Chapter 11 the future of EBC is discussed as unclear, yet promising. This chapter, its author states, is meant to provide some background to stimulate the reader to investigate EBC further.

Chapters 12 through 14 seem to me a bit artificially added to the book. The presence

of Chapter 12, on leukotrienes and prostanooids, and Chapter 14, on cytokines and chemokines, can be justified, because these mediators are detectable and assessed in EBC, but I do not understand why the editor included Chapter 13, on neurogenic airway inflammation and tachykinins, as these topics are not really part of the field of exhaled markers of respiratory disease, and the book should be solely dedicated to noninvasive monitoring of airway inflammation, not just inflammation per se.

In summary, this book provides a comprehensive and profound overview of EBC and its use in clinical medicine. I commend the editor for a worthy addition to the respiratory research literature.

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