

Respiratory Physiology. Basics and Applications

Alan R. Leff and Paul T. Schumaker
Philadelphia, PA: Saunders, 1993, 198 pp., illus., index, \$21.95

In part I of this volume, Leff and Schumaker have provided the classics of respiratory physiology and applied them to clinical testing. But a major component of this text, and its uniqueness, lies in part II, devoted to lung growth and development, cellular defense mechanisms, neurobiology of the lung, and the biology of the conducting airways.

Part I, subtitled Physiological Functions of the Lung, presents, in 134 pages, eight chapters on mechanics, ventilation, circulation, diffusion, gas transport, ventilation/perfusion relationships and control. A ninth chapter summarizes the physiology of exercise. The presentation is briefer and less detailed than in other texts and seems more in concordance with the eight to ten hours of lecture time typically devoted to respiration in a freshman medical physiology course. The authors make good use of graphs and equations while derivations of equations are appropriately limited. There is good reference to clinical testing. I was pleased to find mention of choke

point flow and citation and interpretation of the wave speed equation in the airflow dynamics section and to see emphasis on gas solubility of oxygen in the chapter on diffusion; these important topics are often overlooked in texts at this level.

The thirty-seven pages of part II, subtitled Lung Cell Biology, contain three chapters (Lung Growth and Development, Lung Defenses, biology of Conducting Airways). Generally, the content of part II relates to classic respiration physiology but there is abundant biochemical, histological and pathological content that is not typically presented in an introductory physiology course. The first of these chapters describes fetal gas exchange and the process of alveolization of fetal and neonatal lung. Particle deposition and clearance, and a brief section on pathophysiology of alveolar macrophages, make up the content of Lung Defenses. The chapter on conducting airways seems a bit anachronistic and probably represents a special interest of the authors. Its content seems more appropriate for a later time on the medical curriculum, but it undeniably contains some material of a basic physiological nature.

My impression is that this book provides, in part I, an overview of classic respiratory physiology better attuned to the time now typically allotted to its consideration than are its competitors. In a first course, part II might well be looked upon as supplemental. At a later stage of training, part I might be used as a review of classic physiology and part II as an introduction to related topics in cell and tissue biology. Overall the content is modern and inclusive, generally well written and illustrated, and reinforced by review questions (with answers) for each chapter.

There are, however, numerous problems of varying seriousness, some of which I cite. There are no educational objectives or literature references. Transpulmonary pressure is incorrectly defined. There is an incorrect algebraic derivation in the text and another in the answer to one problem, and there are several other errors in figure legends, figures, and definitions that suggest there has been less than critical review. There is failure to show accurately the phase relationship of transpulmonary pressure to volume during tidal breathing that is not helpful to those who wish to make more of the reactive and resistive components of that pressure. No mention is made of gas laws or of the conventions for reporting volumes and as a consequence, many equations are not in the applicable form: this is no doubt done in the interest of simplicity, but a brief justification would be appropriate. Similarly, only the approximate "ideal" alveolar air equation is given when the full form and a brief discourse on the principle of its derivation teaches a valuable lesson. Breathing during sleep is largely ignored. More attention could be given to the nature of the fibrous skeleton of the lung and to the functions of capillary endothelium. Inclusion of the V/Q equation based on R, alveolar ventilation, and the fick equation, would be useful. Some of the material on conducting airways could have been used, or referred to, in the chapters on mechanics and control.

My overall impression is that this book will best serve as a syllabus in a guided education experience where the instructor can take an active role expanding, clarifying, correcting, and documenting the text. Its strengths include brevity with broad coverage and its deficiencies can be easily recognized and corrected. It would be a less favorable text for unguided self-study: for that, and for the provision of compulsive attention to details to students who have the time, my personal choice is "Basic Respiratory Physiology" by Norman Staub.

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