

tive research programs on the subject. As is stated simply in the final summary chapter, what this book is about is trying to answer 2 questions: what is it about particles that makes them harmful or not? and how do harmful particles cause harm? Though the answers remain incomplete, the contributors to this book did an excellent job of compiling the information relevant to answering those questions.

This volume would be most useful for university and medical-center physicians who are active researchers, toxicologists, pathologists, environmental health researchers, air pollution experts, government regulators, and epidemiologists who would like to understand better the toxic mechanisms and health effects of particles.

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Pulmonary Drug Delivery: Basics, Applications and Opportunities for Small Molecules and Biopharmaceutics. Karoline Bechtold-Peters and Henrik Luessen, editors. *APV-Pharma Reflexions* series, volume 2. Aulendorf, Germany: Editio Cantor Verlag. 2007. Soft cover, illustrated, 412 pages, \$200.

In 1971, medical aerosol therapy in the hospital was largely use of drugs such as isuprel and racemic epinephrine, and our biggest choices were mainstream or side-stream jet nebulizers, with an occasional ultrasonic nebulizer thrown in the mix. Meanwhile, aerosol innovations such as the pressurized metered-dose inhaler, introduced in the mid-1950s, were left in the medicine cabinet when patients entered the acute care setting. Only after another 15 years, and as our scope of practice began to expand from the hospital to the clinic and home, did we become more active in supporting the use of the innovative dry powder inhalers and pressurized metered-dose inhalers, with the broader range of medications that they were designed to deliver.

In the hospital, respiratory therapists have been at the epicenter of the aerosol universe, even though liquid nebulization represents far less than 5% of aerosol therapy

prescribed to patients. Nonetheless, as a profession we receive far more time learning about the range of aerosol delivery devices and inhaled medications than virtually any other medical or allied health profession. This education and our involvement in therapy administration positions us to be valuable advisors on device options and their proper use for the health care team. However the 20–40 pages in the typical 1,200+ page respiratory care textbook is not sufficient to fulfill that important role. Journals such as *RESPIRATORY CARE* have been a tremendous source of more comprehensive information on aerosol, but its focus is more clinical application and differential selection than product development and characterization.

Respiratory therapists offer a unique perspective on the use and usability of aerosol devices. This has been recognized by increasing numbers of biotechnology and pharmaceutical companies that seek knowledgeable respiratory therapists to contribute in a variety of functional areas, including research and development, clinical operations, regulatory affairs, business development, marketing, and sales. The transition from the bedside to the world of biotechnology and pharmaceuticals can be both exciting and disorienting, and requires a rather steep learning curve.

Transition to aerosol device and drug development can be just as disorienting for pharmaceutical development professionals with expertise in oral and parenteral dosage forms. That is why the International Association for Pharmaceutical Technology (*Arbeitsgemeinschaft für Pharmazeutische Verfahrenstechnik [APV]*) sponsored a 2-day workshop on pulmonary delivery. Over the next 5 years the core faculty, with some additional academic and industry experts, put pen to paper to create 6 chapters to bridge the most relevant topics in pulmonary research and development.

Chapter I introduces the principles of aerosol drug delivery in 2 therapist-friendly parts. “Understanding Clinical Aerosol Therapy” describes the respiratory system and the range of devices and drugs currently used in the treatment of asthma and chronic obstructive pulmonary disease. “Biophysical Parameters Determining Pulmonary Drug Delivery” is a primer on factors that affect local and systemic aerosol delivery. This is familiar territory for respiratory clinicians, with additional information not available in our standard texts.

Chapter II focuses on models used to test drugs and devices. In vitro models for pulmonary drug absorption and in vivo animal models are described in sufficient detail to provide good orientation to the processes required for clinical aerosol drug/device development. A clinician’s perspective on systemic aerosol therapy focuses on the examples of insulin, heparin, and estradiol.

Aerosol application devices are the focus of Chapter III, which starts with a comprehensive review of current aerosol delivery device technology, and transitions to the role of new and emerging technologies in pulmonary drug targeting. Again, this is familiar territory for the therapist, that should add depth and breath to our standard training.

Chapter IV, “Formulation and Production,” describes the science of formulating drugs for use with devices. The form and function excipients added to the active drug are described in some detail, and systems used for making and packaging dry powders are presented in a clear and readily assimilated format.

Chapter V, “Regulatory Issues and Analytics,” was an unexpected pleasure. The pedantic aura surrounding regulatory affairs is dissipated with an easy-to-understand functional description of the regulatory framework of drug development, integrated with the methodologies required for device and drug testing and aerosol characterization.

The final chapter discusses new trends and opportunities for aerosol drug development. Examples of microparticles and liposomes as pulmonary delivery systems are described. The paradigm of systemic delivery through the lungs is explored, as is the use of aerosol for delivery of vaccines. This culminates in a review of market trends in pulmonary therapies.

This is an excellent, up-to-date primer ideal for practicing therapists who want to bolster their knowledge of and skills with aerosol devices and delivery systems, as well as those who might want to play a role in making new aerosol products available for meeting unmet needs of our patients by participating in the biotechnology and pharmaceutical development process.

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