
Basic Research on Lung Surfactant

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Basic Research on Lung Surfactant

Volume Editors

P. von Wichert, Marburg

B. Müller, Marburg

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Foreword

One of the most exciting developments in lung research in the last three decades has been the increasing appreciation of the metabolic activities of the lung. In particular, the link between biosynthetic and secretory processes in lung cells and respiratory function exemplified by the surfactant system has stimulated a large body of scientific work which is already finding some clinical application.

The lung that lacks surfactant does not work very well. This phenomenon was first recognized in premature infants as the respiratory distress syndrome, or hyaline membrane disease, but it is now becoming clear that other lung diseases, among them acute pulmonary failure in adults, may involve dysfunction of the surfactant system. Starting from purely scientific beginnings, surfactant research has broadened to include clinical investigations by pediatricians, internists, anesthesiologists, surgeons, and pathologists who hope to evolve new forms of therapy for their seriously ill patients. It may be hazardous, however, to attempt to translate research findings into clinical practice, if the scientific basis is not solid or if therapeutic aspirations too greatly exceed realistic expectations. This difficulty particularly affects surfactant research. Many unanswered questions plague our understanding of events in the alveolar regions of the lungs, especially in the presence of disease processes. It is reasonable, therefore, to go back to basic issues in order to strengthen the rationale for new therapies. This idea motivated the organization of the Third International Symposium on Basic Research on Lung Surfactant, whose proceedings are summarized in this volume.

At present, surfactant research is an especially exciting field. On the one hand, the surfactant system, Janus-like, links pulmonary function and

lung biology just as mechanics and intermediary metabolism were long ago linked in muscle contraction. On the other hand, new knowledge about the generation, transport and regeneration of surfactant components has fundamentally changed our view of the lung and opened a field of research that leaves traditional respiratory physiology far behind, not withstanding the dominant position of gas exchange efficiency as the gold standard for lung function. Nonetheless, investigations of lung hormones, of clearance of mediators in the pulmonary circulation, and of many other functions, sprang from the belated recognition that the lung has an active metabolism. The body as a whole depends on this group of functions only slightly less acutely than on efficient gas exchange.

It is now well known that lung surfactant contains both phospholipids and specific proteins. The phospholipid components have been studied for years, and their metabolism and properties in normal and diseased lungs are fairly well described. The surfactant proteins, on the contrary, have only recently come under close scrutiny, despite evidence from the earliest experiments that surfactant function is protein dependent. Progress in the methods of protein chemistry, immunology and molecular biology has greatly accelerated study of these protein components. Information is now accumulating at a rapid rate about the detailed structure of the proteins, about their metabolism, about their interactions with surfactant lipids, about their effects on alveolar cells, and about their genetic variations. Naturally, the more detailed our understanding becomes, the more new questions arise; and we can see now the need for much further clarification of the physiological and pathological roles of the surfactant proteins. How these roles are disturbed in lung diseases is not clear at present. Although enthusiasm runs high for innovative therapy based on current perceptions of what these proteins do, we should recognize that our knowledge about them is still limited.

How many functions does lung surfactant have? Clearly, it lowers alveolar surface tension, but may it promote airway clearance of toxins or opsonize micro-organisms? How else may it modulate alveolar function and architecture? Does it play a significant role in small airways? How is surfactant turnover regulated in normal and – of special interest to clinicians – pathological states? Do surfactant components counteract, or perhaps promote, certain disease processes? Can surfactant components be used as drugs or to target other drugs to alveolar or bronchiolar cells?

These and many other questions about the surfactant system certainly lack answers at present. To speak more precisely, we are unable to answer

these questions because we do not have adequate basic knowledge about the system. Therefore, fundamental research on lung surfactant is critical, not only for immediate clinical application but also for the longer range goal of more completely understanding pulmonary function in normal and pathological conditions. Towards that end this record of the proceedings of the Third International Symposium on Basic Research on Lung Surfactant not only summarizes recent progress but also points out some gaps in current knowledge that need further attention.

The organizers as well as the participants of the symposium express their thanks for generous support to many institutions and persons.

The Deutsche Forschungsgemeinschaft supports the meeting by covering most of the expenses. The help of the president of the Philipps University of Marburg as well as the Dean of the Faculty of Medicine of the Philipps University is gratefully acknowledged. Support comes also from the Ministry of Science of Hessen and international companies as Byk-Gulden, Konstanz, Calbiochem, San Francisco, Calif., Dr. Karl Thomae, Biberach, Deutsche Wellcome, Burgwedel, E. Merck, Darmstadt, Hoechst, Frankfurt and Boehringer, Ingelheim.

A particular support by Byk-Gulden, Konstanz, and Dr. Karl Thomae, Biberach, makes the publishing of the records of the symposium possible.

The editors of this volume and the authors of the many different papers wish to stimulate many scientists in a fascinating, growing and still expanding field of research.

P. v. Wichert, Marburg

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