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EDITORIAL

To understand how babies breathe.....

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This volume of the European Respiratory Journal holds a statement from the Committee on Infant Pulmonary Function Testing on "Respiratory Mechanics in Infants: Physiologic Evaluation in Health and Disease". This statement is unique in several ways: a) it is the most comprehensive and recent "state-of-the-art article" on this important and rapidly developing topic b) it is the first printed result of a cooperation between the European Respiratory Society and the American Thoracic Society, and, as such, is published simultaneously in the journals of both societies c) beyond the organisatory framework of both societies, it is the product of a truly world-wide international cooperation by a group of distinguished experts in this field.

Throughout the last decade, pulmonologists have witnessed and contributed to extraordinary advances in molecular genetics, biochemistry, and cell biology. Impressed by the rapidly developing conceptual frameworks of a "new respiratory biology", one is almost inclined to dismiss organ system physiology as "an old hat of the past". In making this mistake, one would be forgetting that there still remain some white spots on the map of "conventional" respiratory physiology. The most prominent of these ill-explored areas is lung function in the first few years of life. The reasons for the traditionally, reduced diagnostic accessibility of baby lungs stem from the complete inability of infants and toddlers to cooperate with the standardized lung function tests which are well-established routine for older children and adults. Clearly, to study how babies breathe, one requires a highly specialized approach to their small but rapidly developing and changing respiratory tract, allied with a new set of specifically designed and well-adapted techniques.

The first important steps in this direction were taken more than 30 years ago and subsequently, a small but dedicated group of top-level specialists have continued to further develop and improve the methodology. However, the complexity of early techniques, such as baby plethysmography or pressure measurements with oesophageal balloons, restricted their application to a few highly specialised research centres. This situation changed with the development of newer and somewhat less complex techniques, such as measurement of compliance and resistance of the respiratory system by airway occlusion, measurements of lung volume by gas dilution, recording of flow-volume curves by forced deflation or rapid chest compression, analysis of tidal flow-volume patterns, *etc*. With the subsequent development of commercially available measuring systems, the field of infant lung function testing became more easily accessible to those working with, and caring for, babies with respiratory disorders. The positive aspect of this development was the wide availability of new methods for studying a broad spectrum of clinically and epidemiologically relevant questions in Paediatric Respiratory Medicine. However, the shadows coming with this light appeared unavoidably, being related to the risk that investigators with incomplete physiological and methodological training might approach important questions not only with complex and expensive equipment but also with ill-understood and wrongly applied techniques and without appropriate quality control. This situation called for a major standardization effort that had to define the present role for each technique, the kind of physiological question which can be answered by each technique, where open questions have remained, which new questions have to be asked, and which direction future relevant research should take. The statement in this issue of the journal is the most recent and also the most comprehensive answer to all these demands; in addition, it provides the dedicated reader with an updated bibliography on this rapidly developing subject.

As mentioned initially, respiratory system physiology in this age group can only be considered as incompletely explored; as yet, important questions about the growth and development of respiratory functions in the first years of life have remained unanswered. Related to the issue of normal respiratory development in a healthy baby, are the even more complex questions focused on the impact of disease and treatment on the functional growth of this respiratory system. Important epidemiological and clinical problems call for the broad application of standardized infant lung function testing.

One of the most prominent areas in which our insight is rapidly improving with the application of infant lung function testing, is that of the wheezing infant, with emphasis on the different types of predisposition for and outcome of bronchiolitis and obstructive bronchitis, and the early manifestations of bronchial asthma. Closely related to this spectrum of questions is an urgent need to better understand the origin and evolution of airway hyperreactivity in the first few years of life. Can early therapeutic

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intervention prevent or delay the development of asthma and airway hyperreactivity? Does a conceivable continuity of paediatric asthma onto adult chronic obstructive pulmonary disease offer therapeutic accessibility through a window in the first years of life? Which lessons can be learned concerning the role of passive smoking and other forms of indoor and outdoor air pollution? Which of the available or presently developing prophylactic measures or therapeutic strategies hold the greatest promise?

The discovery of the cystic fibrosis gene and, subsequently, of its product, the "Cystic Fibrosis Transmembrane Conductance Regulator", has provided new insight into the complex pathophysiology of this lethal disease. With this insight comes the development of several new and promising therapeutic strategies including the "star wars approach" of gene therapy. Clearly, all therapeutic concepts targeted on the basic defect and on the prevention of bacterial colonisation hold much more promise when addressing an intact respiratory tract; their potential for interrupting the vicious cycle of bacterial infection, systemic immune response and airway damage, that is characteristic of advanced lung disease in cystic fibrosis, remains more than questionable. This again draws our therapeutic attention towards the earliest stages of the disorder; ultimately, the effects of these new therapeutic approaches that have originated from major advances in molecular and cell biology, will have to be evaluated clinically by employing the new diagnostic tools that are being offered to us from ongoing advances in organ system physiology, *i.e.* infant lung function testing.

Hyaline membrane disease is now approached by the instillation of surfactant into the lungs of premature infants. However, even with this significant advance, in combination with sophisticated strategies of mechanical ventilation and intensive care, important therapeutic questions concerned with the acute and the chronic stages of neonatal lung disease have so far remained unanswered. Again, improved, simplified and adapted techniques of lung function testing have found their way into this field and are already offering some of the answers.

These are only a few examples where objective measures of infant lung function supply the basis for significant advances. Ultimately, one could conceive a lifelong continuity of physiological insight into the human respiratory tract, ranging from the newborn (or even foetus?) and infant, through child- and adulthood, to the aged. Although impressed by this concept, one is not to forget that even now, with the ongoing development of sophisticated techniques of infant lung function testing, there remains a "lung function hole" between the second and the sixth year of life. Here, infant techniques can no longer be applied and the conventional techniques are not yet suitable. This age range, clearly of utmost importance in the epidemiology of all chronic lung disorders in children, offers another major challenge to the physiologist and paediatric pulmonologist. It follows that we are by no means at the end, but rather in the middle of an ongoing and exciting development; there is still plenty of room and need for brilliant ideas, ingenious new concepts and meticulous research work.

Additional comment should focus on the way and by whom the discussed statement on "Respiratory Mechanics in Infants: Physiologic Evaluation in Health and Disease" was produced. In 1989, the Paediatric Working Group of the European Society for Clinical Respiratory Physiology (SEPCR) published a report on the standardization of lung function tests in Paediatrics. Even then it was felt that future standardization efforts should focus increasingly on specific techniques for evaluating respiratory functions in infants. Then came the merger between the SEPCR and the SEP, and, as its result, the European Respiratory Society (ERS) was born. The members of the above Working Group reconvened as the Scientific Group on Paediatric Respiratory Physiology of the ERS Paediatric Assembly and continued the above standardization efforts with special focus on the newborn and infant. At the same time, a task force of the Paediatric Assembly of the American Thoracic Society (ATS) had started to work towards a standardization of infant lung function testing. Since both groups had invited experts from all over the world, it did not take long to realize that both the European and the American groups were based on almost identical membership lists and were pursuing the same goals. The logical step was a merger of these two task forces, carried ahead by personal friendship and supported by both Societies. As a consequence, the ATS-ERS Committee on Infant Pulmonary Function Tests is the first joint venture of both societies and will hopefully lead the way towards similar joint endeavours in the near future. The discussed statement is the first printed result of this joint venture; as such, it is published simultaneously in the European Respiratory Journal and in the American Review of Respiratory Disease.

Despite all that has been said, it would be a mistake to consider the Committee, or its statement in this issue of the journal, as a mere European-American achievement. While the ERS and ATS provide the organisatory framework for the Committee, major contributions by colleagues from Australia and Israel illustrate that the scope of this cooperation exceeds the joint European-American perspective by far. Thus, we are privileged to read a truly international state-of-the-art piece; as such, it illustrates the urgently needed spirit of international scientific cooperation on a global scale. May the discussed statement succeed to carry the torch a few steps further in that direction!