Physiology and Pathology of the Mucociliary System

Special Regards to Mucociliary Transport in Malignant Lesions of the Human Larynx

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Foreword
The ancient Greek philosopher Heraklit (about 500 B.C.) framed his profound insight into the fundamental mechanism governing Nature and the Universe in his statement 'panta rhei': everything is flowing, nothing is at rest. Flowing means that some material is transported from one place to the other, and transportation, in fact, seems to be one of the essential processes by which the physiological equilibrium is maintained, carrying materials and messages, and weaving innumerable places and reactions into the pattern of a living individual.

We find transportation at the level of cells in the dimension of atoms and molecules governed by physical processes like diffusion and osmosis, or by active biological processes like secretion and absorption. The nervous system transports electrical and chemical signals, handling an enormous flow of information. In other organ systems there is mass transportation of various materials driven by muscular action: heart and blood circulation, carrying metabolic building blocks, hormones, heat and a multitude of other things; intestines and peristalsis conveying ingesta; inspiratory muscles transporting gases, vapors and airborne particles.

There is a special system of transportation for dealing with the airborne particles, contaminating the air we breathe. It is continually cleansing and renovating the surfaces of the respiratory system: the mucociliary apparatus. From a phylogenetic point of view this system combines two of the very earliest achievements of Nature, the production of mucus, which is already present in primitive algae, and the principles of locomotion or transportation by the whipping movement of cilia, realized to perfection already in certain protozoa.

This book gives an excellent survey of our knowledge of the mucociliary transport in the respiratory system, based on a thorough evaluation of the literature and the author's own investigations. Defects of this transporting mechanism may be due either to malproduction of the mucus or to malfunction of the ciliary apparatus. They are the root cause of manifold diseases of the respiratory system. The author's own studies demonstrate that inhaled particles, carcinogenic as they may be, are transported by the mucociliary system from the bronchi via the trachea to the sublaryngeal region, where they have to by-pass the non-ciliated vocal cords in order to get drained into the alimentary tract. Larynges that had developed carcinoma regularly show abnormalities of the mucociliary transport in this region.

It is my pleasure to introduce this book to the reader. It will certainly contribute considerably to our understanding of the pathophysiology of
diseases of the respiratory system, including nose and sinuses, larynx, trachea, and bronchi, be they inborn or acquired, inflammatory, acute or chronic, traumatic or neoplastic. Thus it will prove a valuable source of information for all specialists involved in the treatment of these diseases.

Professor Dr. Harald Feldmann
Director of the ENT Department of
the University of Munster