Role of nasal epithelium in infectious and allergic inflammation

De Yun Wang
(Department of Otolaryngology, Yong Loo Lin School of Medicine, National University of Singapore, Singapore)

The nasal epithelium is exposed first, and to a greater extent than the bronchial epithelium, to all environmental agents, including infectious agents, allergens, and air pollutants, and thus protects the lower airways. Under inflammatory stress, nasal epithelium can undergo injury, followed by rapid remodelling ranging from nasal epithelial hyperplasia, to goblet-cell metaplasia, to denudation, loss of cilia, fibrosis, and, basement membrane thickening. Nasal epithelial repair and remodeling is a highly organized and well-coordinated process, involving inflammation, proliferation, differentiation, matrix deposition, remodeling, and is regulated by a wide variety of growth factors (GFs) and cytokines. From in vivo and in vitro studies conducted both in human and animal models, undifferentiated basal cells (progenitors) are able to migrate from adjacent epithelium, spread over the denuded basement membrane, and proliferate in injured regions (self-renewal) in necessary (homeostasis) or excessive (hyperplasia) degree. Progenitor cells reorient to an apical–basal polarity, and progressively differentiate into ciliated and non-ciliated columnar cells and goblet cells, reconstituting a functional respiratory epithelium after several weeks. This recovery process can be observed during various types and severity of injury, and also in common nasal diseases, including acute viral, allergic, and non-allergic rhinitis, as well as chronic rhinosinusitis with and without nasal polyps. Although nearly 10,000 articles about nasal epithelium have been published in the past decade, the mechanisms underlying nasal epithelial repair are still understood at only a superficial descriptive level. In order to advance rhinology to the next level of a comprehensive knowledge of the orchestrated genetic and molecular processes acting during epithelial repair, combined clinical and experimental studies using sophisticated investigational plans to elucidate the functions of both the protein-coding and regulatory portions of the human genome are required.