Possible Role of Macrophages in Allergic Rhinitis

C. Bachert
H. Behrendt
K. Nosbüsch
U. Hauser
U. Ganzer

*ENT Department, Klinikum Mannheim, University of Heidelberg; †Medical Institute of Environmental Hygiene at the University of Düsseldorf, FRG

Abstract
Mononuclear phagocytes have been investigated in biopsies taken from the nasal mucosa and in epithelial cell samples from 22 grass-pollen-allergic subjects before season, after allergen challenge and during season by means of immunohistochemistry and electron microscopy. The cells were positive for CD68/EBM11 and HLA-DR, but failed to react with CD1 and CD23/BB10. The cells increased in number during season as well as after allergen challenge, especially in the upper part of the mucosa. Heteromorphy of macrophages, as seen by transmission electron microscopy, confirmed the presence of diverse macrophage subpopulations in the nasal mucosa of allergic subjects. Using brush sampling techniques, CD68-positive and HLA-DR-positive cells significantly increased in epithelial cell samples 4–8 h after allergen challenge, indicating a central role of these cells not only in antigen processing but also in late phase reactions of allergic rhinitis.

Correspondence to: Prof. Dr. Heidrun Behrendt, Medizinisches Institut für Umwelthygiene, Universität Düsseldorf, Aufm Hennekamp 50, D-W-4000 Düsseldorf (FRG)

Allergic rhinitis is characterized by an immediate phase reaction (IPR) leading to mediator release from degranulating mast cells through an interaction between inhaled allergen and cell-bound allergen-specific IgE. The IPR is followed by infiltration of inflammatory cells with a delayed time course, representing the link between anaphylaxis and chronic allergic disease. A variety of inflammatory cells are involved in this process, i.e. eosinophils, neutrophils, basophils and/or mast cells, lymphocytes and probably macrophages. Only little data are available about the role of mononuclear phagocytes including dendritic cells in the upper airways [1]. Using a panel of monoclonal antibodies (CD68, EBM11, CD1, HLA-DR/DP/DQ, LN2, C3bR, anti-IgE, CD8, CD4, IL-2R, CD23, BB10) and electron microscopy, we investigated antigen-presenting cells (APC) and T lymphocytes in nasal biopsies and epithelial cell samples from 22 grass-pollen-allergic subjects before season, after allergen challenge and within season. EBM11+, HLA-DR+, CD1- APC were found in the subepithelial and deeper layers of the nasal mucosa before season, and were clearly increased in number during season. At that time, heteromorphic macrophages exhibiting various stages of maturation could be observed by electron microscopy, indicating the involvement of diverse macrophage subpopulations in allergic rhinitis. This is also confirmed by the fact that up to 4% of the APC were IgE+, but FcεR2/CD23- and BB10- [2]. APC and parts of the epithelium and glandular epithelia expressed the invariant chain (LN2+) and various MHC class II antigens (HLA-DRVDPVaq+). Birbeck granules, which are the main feature of antigen-presenting Langerhans cells in skin at the ultrastructural level, have never been found. The number of macrophages

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on the epithelial surface significantly increased during the late phase reaction (LPR) 4–8 h after allergen challenge and during the naturally occurring seasonal pollen exposure compared to a control group (n = 4), and still remained elevated 4–6 weeks after the pollen season (3.0 ± 1.8 vs. 0.2 ± 0.2%). Again, the cells were EBM1Γ, HLA-DR+ and CD1-. This increase in cell number, which has also been observed in LPR in birch-pollen-allergic rhinitis [3], was not reduced by topical steroids (Budesomid 200 µg/day). There was no significant change in the number of T lymphocytes and no signs of activation (IL-2R+) during LPR and within season in cell samples and biopsy specimens. Our findings suggest a possible role of macrophages in the allergic LPR and indicate the active involvement of the cells in antigen uptake and presentation.

References