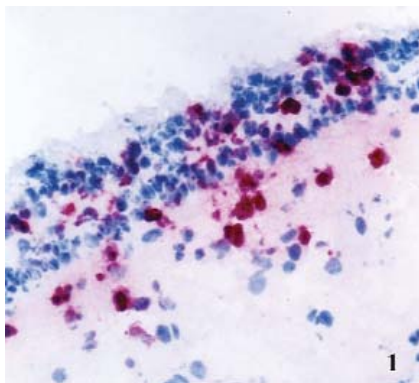


Images in Allergy and Immunology

Qutayba Hamid, MD, PhD, Editor

Inflammatory cells, cytokine and chemokine expression in asthma immunocytochemistry and in situ hybridization

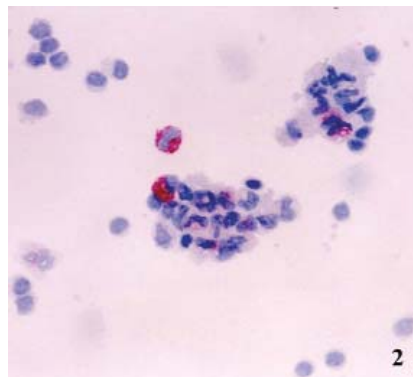
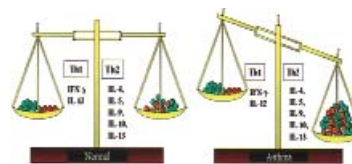
The bronchial wall in asthma is infiltrated by a number of activated inflammatory cells—in particular, eosinophils, which can be detected in the submucosa and within the epithelial cells. This has been demonstrated in **Panel 1** through use of immunocytochemistry with an antibody against major basic protein and



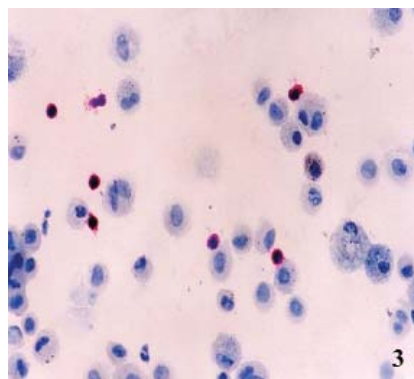
the alkaline phosphatase-antialkaline phosphatase technique. Eosinophils could also be found in the lumen of the airway and could be detected by immunocytochemistry in the bronchoalveolar lavage (BAL) fluid and sputum preparations, as shown in **Panel 2**. CD4⁺ T cells, which orchestrate the inflammation in asthma, could be easily detected in endobronchial biopsies, in BAL (**Panel 3**), or in the sputum (**Panel 4**) through the use of antibodies against CD4. T-helper cells produce

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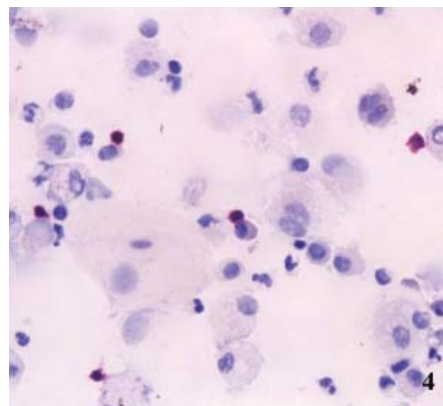
large numbers of mediators, including T_H1 and T_H2 cytokines. T_H2 cytokines are predominant in asthma, and they can easily be detected by the technique of in

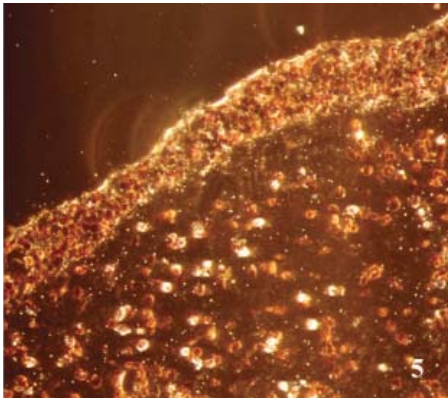


situ hybridization. **Panel 5** is a dark-field illumination of endoscopic biopsy specimen from an asthmatic subject; the visualization was made through the use of

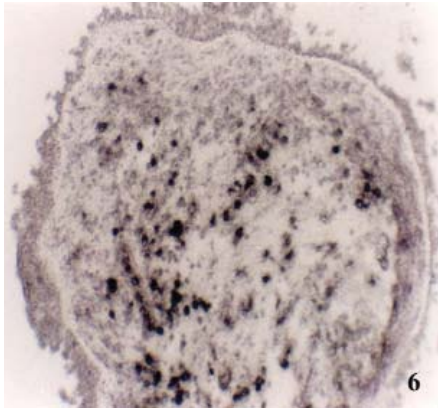


radioactive in situ hybridization and S³⁵ cRNA coding for IL-5. **Panel 6** is a bright-field preparation of an endoscopic biopsy specimen after hybridization with

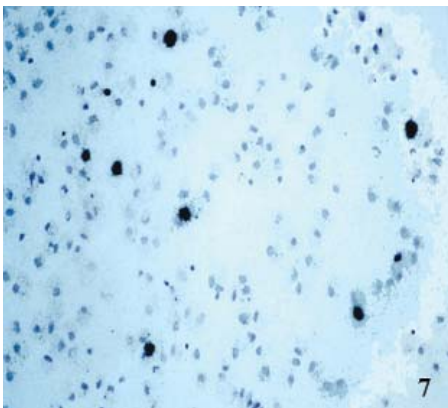




P³²-labeled GM-CSF cRNA probe. T-helper cells expressing T_H2-type cytokines can also be found in BAL and sputum preparations. **Panel 7** is a cytospin preparation from an asthmatic subject that was hybridized with cRNA coding for IL-4 mRNA.

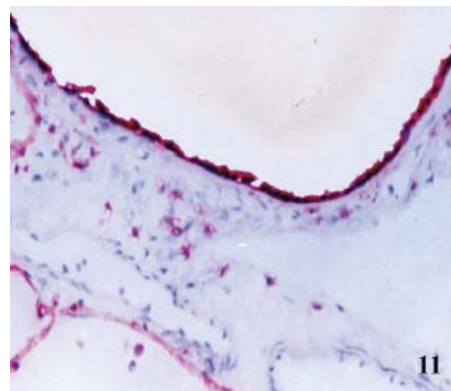
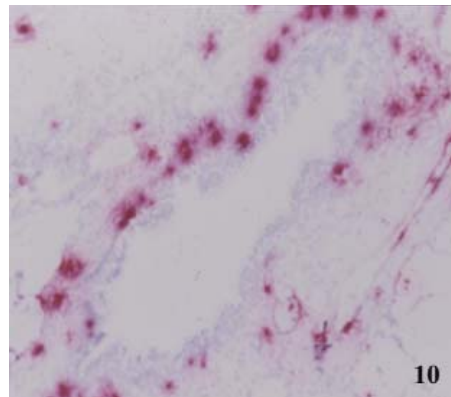
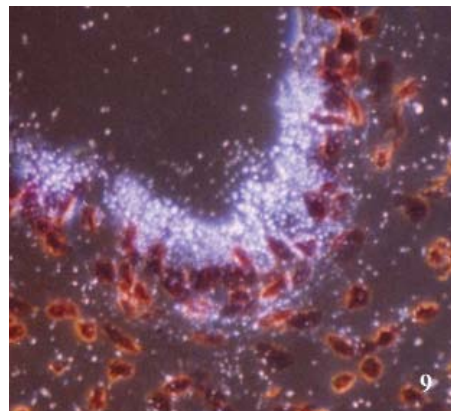
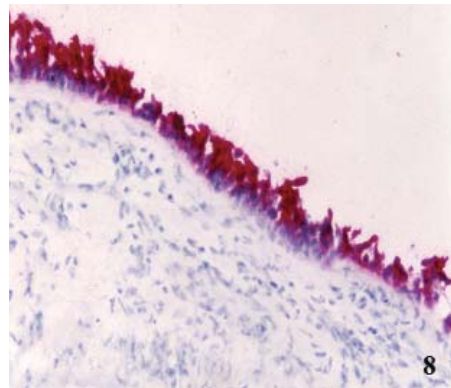


Inflammatory cells, including eosinophils and T cells, are recruited to the airways by specific chemoattractants, including eotaxin, MCP-4, MCP-3, and RANTES. These chemokines are expressed in epithelial cells, inflammatory cells, and smooth muscles.



Panel 8 is an example of immunostaining for eotaxin, which is more specific for eosinophils. Other chemoattractant cytokines, such as IL-16, are more specific for CD4⁺ cells. **Panel 9** is an example of IL-16 in situ hybridization; it shows mRNA expression in the epithelial layer. Inflammatory cells could also produce

IL-16. Inflammation and cytokine and chemokine expression is not restricted to the large airways. Eosinophils (**Panel 10**) and eotaxin (**Panel 11**) expression can be detected in the small airways of asthmatic patients.



Next in the series *Images in allergy and immunology*: Airway remodeling