INFLAMMATORY AND IMMUNE PROCESSES IN THE ALVEOLAR STRUCTURES OF THE HUMAN LUNG IN HEALTH AND DISEASE

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The human alveolar structures possess a full armentarium of inflammatory and immune processes that can be evaluated by bronchoalveolar lavage, a technique in which saline is used to recover cells and non-cellular constituents of the lower respiratory tract via the fiberoptic bronchoscope. In normal, nonsmoking man, 100 ml saline allows recovery of approximately 10% cells of which 90% are alveolar macrophages and 10% are lymphocytes; only rare polymorphonuclear leukocytes are present in the normal lower respiratory tract. Using conventional techniques, surface markers and effector functions of the recovered macrophages and lymphocytes can be evaluated in detail. A variety of macrophage functions will be discussed including production of chemotactic factors, connective tissue specific proteases, and lymphocyte activating factor. In addition, lymphocyte subtype function will be detailed including B-cell immunoglobulin production, T-cell lymphokine production, as well as helper and suppressor functions.

Most chronic disorders of the alveolar structures begin with an alveolitis, the accumulation of inflammatory and immune effector cells within the alveolar structures. Three examples will be used to illustrate how these effector processes are markedly abnormal and very different from that reflected in blood.

1) Idiopathic pulmonary fibrosis—a chronic fibrotic disorder limited to lung with an alveolitis characterized by activated alveolar macrophages and the chronic accumulation of neutrophils in the alveolar structures.

2) Sarcoidosis—a chronic granulomatous disorder with an alveolitis characterized by the accumulation of activated T-lymphocytes within the alveolar structures.

3) Destructive lung disease—both α1-antitrypsin deficiency and cigarette smoking are associated with a chronic, mild accumulation of neutrophils in the alveolar structures. Both have markedly diminished antiprotease protection in the lower respiratory tract.

In addition to discussing the current concepts of the pathogenesis of these disorders, new approaches to therapy will be detailed as will how assessments of the alveolitis are useful in staging these patients and making rational decisions as to therapy.