

## MAIN PATHOGENETIC MECHANISMS OF EMPHYSEMA

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Cigarette smoking and atmospheric air pollution appear to be the major factors responsible for the rising incidence of emphysema. Exactly how they exert their destructive effect on the lung is not completely understood. Smoking and air pollution are considered to expose the bronchial mucosa to chronic irritation, eventually producing chronic bronchitis associated with a chronic cough and increased bronchial secretions. The inflammatory swelling of the mucosa narrows the smaller bronchioles, increasing their resistance to expiration and causing air to be trapped within the lung. The leukocytes that accumulate in the bronchioles and alveoli may also contribute to the lung damage by releasing proteolytic enzymes that attack the elastic fibers making up part of the lung's structural framework. Moreover, the mechanisms that inactivate the leukocyte enzymes are less efficient in the emphysematous lung.

Repeated bouts of coughing, with consequent extreme elevations in intrabronchial pressure, cause the alveolar septa to rupture, gradually converting the alveoli into large, cystic air spaces. The lungs become overdistended and lose their normal elasticity. The patient cannot expel air normally from the overdistended lungs because normal lung elasticity is lost and the bronchiols are obstructed; difficulty expectorating the excessive bronchial secretions and poor drainage of secretions and poor drainage of secretions from the bronchi tend to perpetuate the chronic bronchitis, and a vicious circle is created. The diseased lungs are also more susceptible to infection because of impaired pulmonary ventilation, bronchial inflammation, bronchiolar obstruction, and excessive bronchial secretions. Therefore, patients with emphysema frequently have repeated bouts of pneumonia, further damaging the lung tissue.

For the most part, emphysema can be prevented by refraining from smoking and avoiding inhalation of other substances known to be injurious to the lungs. Atmospheric air pollution contributes to the increasing incidence of emphysema and various measures are being undertaken to control this serious public-health problem.

Once emphysema has developed, the damaged lungs cannot be restored to normal. However, several measures can be employed to promote the drainage of bronchial secretions, to improve pulmonary ventilation, and to decrease the frequency of superimposed pulmonary infections. These measures, along with cessation of smoking, will retard or arrest further progression of the disease.

Experimental surgical procedures called *lung volume reduction surgery* are also being investigated. These procedures excise the nonfunctional extremely emphysematous segments of the upper lobes, thereby reduction in lung volumes will allow the remaining less severely affected lungs to function more efficiently.

The following case illustrates the clinical features of a patient with chronic pulmonary emphysema who developed severe respiratory insufficiency that was precipitated by a bout of pneumonia.