

EFFECTS OF CIGARETTE SMOKE ON LUNG AND SYSTEMIC IMMUNITY

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The influence of cigarette smoke (CS) on human health is still an important problem worldwide. Complex inflammatory processes and changes in the immune system are crucial in the pathogenesis of smoking related disorders like chronic obstructive lung disease (COPD), lung cancer, asthma, interstitial lung diseases (ILD), atherosclerosis as well as infectious lung diseases. The objective of this review is to present the alterations in the immune system of smokers. CS consists of about 4000 substances known to be: antigenic, cytotoxic, mutagenic, carcinogenic which are mainly dispersed in the gas phase. The particle phase contains important constituents of CS, such as: tar, nicotine, aromatic hydrocarbons, phenol. CS contains a high concentration of reactive organic radicals (ROR) and substances producing ROR. Discrete changes in peripheral blood of smokers may be found: leukocytosis, elevated proportion of T cells with slightly elevated proportion of cytotoxic/suppressor cells (CD8⁺). The respiratory tract is the main affected system in tobacco smokers. In the bronchial epithelium, metaplastic and dysplastic changes are accompanied by an elevated expression of adhesion molecules and secretion of many proinflammatory cytokines. CS causes activation of signal transcription pathways in bronchial epithelial cells. In the population of pulmonary macrophages an elevated proportion of cells, changes in the morphology of cells, elevated expression of surface markers of cell activation with impaired phagocytotic and antigen presenting functions have been observed. Chronic exposure to cigarette smoke causes increased production of metalloproteinases (MMP) by macrophages. The influence of tobacco smoke on the population of granulocytes results in an elevated proportion of neutrophils and the concentration of the products of neutrophils: NE, IL-8, TNF α in the airways and lung parenchyma. CS seems to alter the way of death of neutrophils from apoptosis to necrosis. On the other hand, an elevated expression of the receptors of apoptosis on lymphocytes is found. CS enhances the recirculation of lymphocytes, which results in an augmentation in activated and cytotoxic/suppressor cells in the bronchial lumen. In the recruitment of cytotoxic cells, the following cytokines are involved: IL-1b, IL-6, IL-8, TNF α . Bronchoalveolar lavage fluid and bronchial biopsies taken from smokers are characterized by an increased proportion of CD8⁺ suppressor/cytotoxic T cells and a significant decrease of CD4/CD8 ratio. Nonspecific feature is influx of eosinophils into the airways of smokers. The most important way in prophylaxis and treatment of smoking related diseases is smoking cessation. Changes in the immune system, however, are not entirely reversible.