

Effect of Cigarette Smoke on Micro-Architecture of Respiratory Organs with and without Dietary Probiotics

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Abstract : Cigarette smoke induces many physiological and pathological changes in respiratory tract like goblet cell hyperplasia and regional distention of airspaces. It is also associated with elevation of inflammatory profiles in different airway compartments. As probiotics are generally known to promote mucosal tolerance, it was postulated that prophylactic use of probiotics can be helpful in reduction of respiratory damage induced by cigarette smoke exposure. Twenty-four adult mice were randomly divided into three groups (cigarette-smoke (CS) group, cigarette-smoke+ Lactobacillus (CS+ P) group, control (Cn) group), each having 8 mice. They were exposed to cigarette smoke for 28 days (6 cigarettes/ day for 6 days/week). Wright-Giemsa staining of bronchoalveolar lavage fluid (BALF) was performed in three mice per group. Tissue samples of trachea and lungs of 7 mice from each group were processed by paraffin embedding technique for haematoxylin & eosin (H & E) and alcian blue- periodic acid-Schiff (AB-PAS) staining. Then trachea (goblet cell number, ratio and loss of cilia) and lungs (airspace distention) were studied. The results showed that the number of goblet cells was increased in CS group as a result of defensive mechanism of the respiratory system against irritating substances. This study also revealed that the cells of CS group having acidic glycoprotein were found to be higher in quantity as compared to those containing neutral glycoprotein. However, CS + P group showed a decrease in goblet cell index due to enhanced immunity by prophylactically used probiotics. Moreover, H & E stained tracheas showed significant loss of cilia in CS group due to propelling of mucous but little loss in CS + P group because of having good protective tracheal epithelium. In lungs, protection of airspaces was also much more evident in CS+ P group as compared to CS group having distended airspaces, especially at 150um distance from terminal bronchiole. In addition, a comprehensive analysis of inflammatory cells population of BALF showed neutrophilia and eosinophilia was significantly reduced in CS+ P group. This study proved that probiotics are found to be useful for reduction of changes in micro-architecture of the respiratory system. Thus, dietary supplementation of probiotic as prophylactic measure can be useful in achieving immunomodulatory effects.

Keywords : cigarette smoke, probiotics, goblet cells, airspace enlargement, BALF

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