Short Communication

Investigation of peripheral blood mononuclear cells phagocytosis in allergic asthma mice model

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Abstract

Background: The respiratory system is exposed to the potentially harmful environment agents. More importantly, respiratory system infection is an important risk factor for inflammation and some pathogens can be main responsible of asthma. Phagocytosis is a main mechanism to eliminate of microbial infection. Phagocytic clearance may control asthma pathogenesis. In asthma, cytokines balance may be changed, therefore we investigated possible change in phagocytes in the present study.

Materials and Methods: 14 male Balb/c mice were divided into two control and asthmatic group. Asthma model in mice was produced by ovalbumin. Peripheral blood mononuclear cells were separated and reduction nitro blue tetrazolium and latex bead florescence phagocytosis tests were done.

Results: There was no significant difference in phagocytosis and NBT reduction test between asthmatic and control groups (P≤0.05).Airway inflammation and unbalancing of cytokines in asthma might modulate phagocytosis function.

Conclusion: Therefore, asthmatic patient might be more susceptible to airway infection but there was not any notable changes in phagocytosis

Keywords: Infection, PBMC, Allergy, Asthma, hygiene.

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Introduction

Respiratory system infection with bacteria and viruses is an important risk factor for inflammation (1). According to hygiene theory, when infectious disease has the high prevalence, allergic disease would be in the lowest amount of prevalence in population (2). But some pathogens can be main responsible of asthma with cough, whizzing and breathlessness symptoms (3, 4). Alveolar macrophages are responsible for phagocytosis of respiratory pathogens (3). Phagocytosis is a main mechanism to eliminate of microbial infection. Monocytes are produced in the bone marrow and enter the peripheral blood. Then passing into the tissues and converting into macrophages. The main tasks of this cells are based on removing microorganisms, dead cells, or their residues and harmful particles in the process of phagocytosis (5-7). Macrophages as the professional phagocytes cells, recognize, engulf and eliminate pathogens (8, 9). The respiratory system is exposed to the potentially harmful environment agents through the inhalation (particles, suspended toxins, allergens, and pathogens). Resident macrophages defense against inhaled...
pathogens (10, 11). Pro-inflammatory cytokines orchestrate the infiltration of immune cells to sites (12, 13).

Eosinophils which mediate inflammation of airway and hyper-responsiveness are the main problem in asthma. Therefore, removal of eosinophils can be an important mechanism to protect the tissue from allergic inflammation. Apoptotic eosinophils can be engulfed by alveolar macrophages. Phagocytic clearance of apoptotic cells may control asthma pathogenesis. In asthma, cytokines balance may change, therefore the possible alteration in phagocytes (4, 14-16) was investigated in this study.

**Methods**

In this study, 14 male Balb/c mice were selected and divided into two groups: negative control group (control group) and asthmatic group. Asthma model in mice was produced according to standard protocol with ovalbumin (17). Blood samples were taken and peripheral blood mononuclear cells (PBMC) were separated then reduction nitro blue tetrazolium (NBT) and latex bead florescence phagocytosis tests were done according to previous study (18).

**Results**

There was no significant difference in phagocytosis between asthmatic and healthy groups. Moreover, NBT reduction in two groups has no meaningful change (P≤0.05). In phagocytosis latex bead florescence test, phagocytosis index (the number of cells that had phagocytosis) and phagocytosis speed (the number of latex bead florescence that had been phagocytized by cells) had no significant difference (P≤0.05) (fig. 1).

**Discussion**

In the current study, there was no differences in phagocytosis power between asthma and control groups. Some studies demonstrated that phagocytosis in the moderate and severe asthma of pediatric was decreased compared with in adults. Therefore, innate immune response with phagocytosis might be impaired in asthmatic children that might be response to respiratory system infection in mentioned population (19, 20). This no difference in our study that may be related to age of mice, because our study groups were adult normal mice.

Innate immune system is important for clearance of respiratory infections. Phagocytosis is one of these mechanism. In this study phagocytosis was investigated in the presence of larger particles and there was not significant differences between asthma and healthy groups. Probably pinocytosis as the nonspecific uptake of fluid and solutes or endocytosis as the specific process of small particles (21, 22) might be different in asthmatic patients in specific conditions.

Other studies demonstrated that phagocytosis has reduced in patients with chronic obstructive pulmonary disease (COPD) and cystic fibrosis similar asthma in children. They had reduced phagocytosis process against bacteria and apoptotic cells (23-25). Phagocytosis dysfunction can be influenced with disease states (phagocytes phenotype) and our findings suggest that inflammation might have an important effect on phagocytosis in the human airway. They had reported no data about adults and phase of diseases. Recently, it was observed no phagocytic differences

![Figure 1. NBT reduction and latex bead florescence phagocytosis tests in healthy and asthmatic groups.](image-url)
between adults with mild-moderate asthma and healthy people and in one study phagocytosis did not differ between control group and mild intermittent asthma patients (26).

Airway inflammation and unbalancing of cytokines in asthma might modulate phagocytosis function. Therefore, asthmatic patient with mucus hypersecretion (as suitable environment for infectious agents localization) might be more susceptible to secondary airway infection and other problems but this hypothesis is not approved and in our study, there was not any notable changes. However, the relationship between viral and bacterial infection of respiratory system in asthmatic children is not clear.

**Conflict of Interest**

There is no conflict of interest among authors.

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