

Exploring Related Progress in Asthma Treatment Based on The Pathogenesis of Asthma

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Abstract. Asthma is a disease widely distributed in the world, and mainly produced by allergens stimulating the respiratory tract. At present, the treatment of this disease is mainly the combination of glucocorticoids and other drugs such as β -receptor agonists, vitamin D, montelukast sodium and so on. Bronchial asthma in children can lead to airway remodeling and other symptoms, but the specific pathogenic factors are not clear. This article reviews the recent studies on the pathogenesis, pathogenesis and treatment of asthma. It was found that the occurrence of asthma could be effectively controlled by keeping away from allergens and using vitamin D and other drugs combined with glucocorticoids. The causes of asthma are extremely complex, not only involving external factors but also involving its own factors, such as nervous, endocrine and immune systems. This paper analyzes the factors involved in asthma in a single way, and future research needs to focus more on the analysis from a comprehensive perspective. Vitamin D has the prospect of becoming an effective treatment for asthma in the future.

Keywords: Asthma; environmental factor; glucocorticoid; vitamin D.

1. Introduction

Bronchial asthma is a common chronic inflammatory disease of the airway in the whole country. Individual allergic constitution and the influence of the external environment are the main factors of the disease. Asthma is an allergic disease that often develops after exposure to allergens such as dust mites or animal wool.

Studies have shown that the pathogenesis of asthma is affected by many factors such as genetics, geographical location, environment, and economy. The incidence of asthma is higher in developed areas than in poor areas and in urban areas than in rural areas, mostly due to air pollution, The incidence in southern China is lower than that in northern China, where the climate is cold and easy to cause irritation to the respiratory tract. In addition to environmental factors, some diseases such as bronchitis or pneumonia and inflammation may also trigger asthma. The outbreak of novel coronavirus pneumonia in 2019 has also become one of the major causes of asthma. Asthma is a genetic disease, and the prevalence of asthma in relatives is higher than that in the population, and the closer the relatives are, the higher the prevalence of asthma. The more severe the patient, the higher the prevalence of the relatives. At present, most patients with asthma have allergic constitutions and are sensitive to many stimulants and allergens. Current studies on asthma have found that air pollution is one of the most important factors for the onset and aggravation of asthma compared with dust mites and pollen. In an animal experiment, soluble PM_{2.5} extract was found to induce oxidative stress and enhance the expression of proinflammatory factors by activating nuclear factor- κ B and mitogen-activated protein kinase signaling pathways, while reducing airway barrier function [3]. At present, allergen immunotherapy and biological therapy are the main treatments for asthma. Allergen immunotherapy aims to reduce the immune tolerance of T cells and Th2 cells to allergens, and biological therapy is the use of biological agents to inhibit the airway response of asthma. At present, the wide application of such biological agents also leads to some allergic reactions to biological agents. At present, in view of this type of problem, some studies have proposed that the establishment of a database of allergic reactions to biological agents can better make asthma drugs benefit more people. The pathogenesis of asthma involves the environment, the body and many other fields. Therefore, this paper will analyze the research related to the pathogenesis of asthma and the

corresponding treatment measures in recent years, in order to find the future research trend of asthma and provide reference suggestions for future research.

2. The Law of the Onset of Asthma and Risk Factors

Asthma, as a common chronic airway inflammatory disease, is widely distributed in the world. According to statistics, there are currently about 334 million asthma patients in the world, China has more than 3000 patients with asthma, the world every year of respiratory failure caused by asthma symptoms such as the death toll of about 250000 people, the prevalence is also increasing year by year [1]. Asthma is divided into intrinsic asthma (non-allergic) and extrinsic asthma (allergic), among which allergic asthma is the most prevalent and common asthma phenotype. This section will review the regularity of asthma and its pathogenic factors.

2.1. Air Pollution

With the development of society and the change in environment, PM_{2.5} as main allergen in the air pollutants is closely related to the occurrence of allergic asthma. PM_{2.5} for suspension of fine particles in the atmosphere, it is less than 2.5 microns in diameter, easily absorbed by the body, the harm to human body is great. Studies have shown that PM_{2.5} can be deposited in the respiratory tract after inhalation, especially in small airways and alveoli, which may be one of the important factors leading to the occurrence of asthma [2]. PM_{2.5} after inhalation of airway epithelial cells and nerve receptors has very strong stimulation, which will lead to inflammation of the respiratory tract. Animal experiments have shown that soluble PM_{2.5} extract induces oxidative stress and increases the expression of pro-inflammatory factors by activating nuclear factor- κ B and mitogen-activated protein kinase signaling pathways, and can also reduce airway barrier function [3]. With the increasingly serious atmospheric pollution, asthma patients also will increase, according to the generalized additive model, Ningbo PM_{2.5} concentrations increase by 10 $\mu\text{g}/\text{m}^3$, summer and winter asthma outpatient visits increased by 1.14 and 2.40% respectively [4].

2.2. Climatic Factors

In addition to air pollution, climate change has also become a key factor in allergic asthma. Due to the increase in carbon dioxide concentration in the atmosphere, the global climate is warming, and the photosynthesis and reproductive capacity of plants will increase accordingly [5]. Pollen production will also increase, sensitization characteristics of pollen also change [6]. This could lead to an increase in the number of people with asthma due to pollen. In addition, allergens such as pollen and dust mites may also be adsorbed by PM_{2.5}, triggering or aggravating asthma symptoms. There are two main reasons why cold weather triggers asthma. On the one hand, due to the decrease in temperature, according to the survey results [7], Cough and wheezing symptoms increased by 25.7% and 23.1% respectively in 20-27-year-old young people with asthma and allergic rhinitis in cold weather. On the other hand, it is caused by vitamin D deficiency. Period of current study showed that cold weather, sunshine time, go out a shorter time, corresponding to reduce the amount of vitamin D in the body, and the lack of vitamin D can lead to increased frequency of acute attacks of asthma [8].

3. Pathogenesis of Asthma

3.1. The Pathogenesis of Asthma Caused by PM_{2.5} and Other Allergens

Because PM_{2.5} has a direct stimulating effect on respiratory epithelial cells and neuroreceptors, if the human body is exposed to PM_{2.5} for a long time, respiratory epithelial cells will undergo pathological remodeling. For example, extracellular matrix protein deposition can lead to airway remodeling, epithelial smooth muscle hyperplasia and hypertrophy can lead to airway stenosis and airway wall thickening [9]. These pathological remodeling also contribute to the development of asthma. In addition, PM_{2.5} contains special composition of PAHs and oxygen free radicals, these

elements can lead to helper T cells and Th17 mediates the emergence of allergic inflammation [10]. After cells are stimulated by PM_{2.5}, a large number of reactive oxygen species and reactive nitrogen species are produced in the cells, which leads to an oxidative emergency response [11]. Asthma involves the participation of many genes in the formation of the above mechanisms. For example, in an animal study, mice exposed to high concentrations of pm_{2.5} for a long time showed increased expression of inflammatory genes (Cxcl11 and Tnfs4) and allergy and asthma genes (Clca3 and Prg2) [10]. In humans, the expression of such genes may also lead to the aggravation of an existing disease state [12].

3.2. The Pathogenesis of Cold Air on Asthma

After the cold air is inhaled, often causes damage to airway epithelium, or even falls off. In cold areas, there is less water in the air, and large amounts of dry, cold gas can also cause asthma. When human body's skin is cold stimulation can produce contraction, the cold air suction, bronchial also can produce contraction, especially in patients with asthma [13]. Most studies now believe that after a large amount of cold air inhalation, airway epithelial cells are affected by cold air and are in a hypertonic state. Cells in this state will release inflammatory mediators, which will lead to bronchial constriction [14].

3.3. Vitamin D Deficiency

As mentioned above, the amount of vitamin D in the body will also decrease under the influence of less sunlight and less time outside. Vitamin D has a strong regulatory effect on immune cells, enhancing the activity of immune cells (eosinophils) and reducing the production of inflammation. Vitamin D can also reduce airway remodelling related enzyme expression, inhibit of proliferation of smooth muscle, reduce the effect of mucus secretion, thus suppressing asthma [15].

4. Bronchial Asthma Treatment and Medication

4.1. Allergen Detachment

As mentioned above, PM_{2.5}, pollen, dust mites and other substances in air pollution are allergens that may cause asthma. Patients can judge and stay away from these allergic substances under the diagnosis of doctors, and patients take protective measures, such as wearing N95 and KN95 masks, and reducing travel in polluted weather. Practice has proved that the patient's asthma symptoms can be effectively relieved.

4.2. Combined Effects of Glucocorticoids and β -agonists.

Glucocorticoids are widely used in the treatment of asthma, and their principle of action is to inhibit smooth muscle contraction and have anti-inflammatory effects [16]. It is also effective in alleviating allergic reactions. Long-acting β 2-agonists, such as indacaterol, act on β 2-receptors on bronchial smooth muscle after inhalation and have long-lasting bronchodilator effects [17]. For the treatment of asthma, the treatment effect of single inhaled glucocorticoid is not good. At present, glucocorticoids combined with long-acting β receptor agonists have a very significant effect [18]. Inhaled budesonide and formoterol powder, in which budesonide is a glucocorticoid and formoterol fumarate is a β 2 receptor agonist, can effectively relieve asthma and maintain stable and unblocked breathing when used in combination. A previous study compared the clinical data of 80 patients with asthma admitted to the Department of Respiratory Medicine of Wuhan Municipal Hospital, 40 cases were treated with conventional treatment, and the remaining 40 cases were treated with compound preparations. The results showed that the inflammatory indexes, small airway function and lung function indexes of the compound preparation group were better than those of the conventional treatment group [18]. The results showed that the combination of glucocorticoid and β -receptor

agonist was superior in the treatment of asthma, and it could also improve the quality of sleep of patients [18].

4.3. Sugar Cortical Hormone Drugs Combined with Vitamin D

As mentioned above, asthma is also caused by vitamin D deficiency. For the treatment of asthma, on the basis of traditional glucocorticoid combined with vitamin D treatment, can also significantly improve the degree of asthma symptoms and the number of attacks [16]. Previous research is chosen according to the first People's hospital treated 240 cases of children with bronchial asthma as the research object, in which 120 cases as control group, gave a general anti-infection, oxygen therapy and terbutaline sulfate and budesonide aerosol as a treatment, The other 120 cases were treated with vitamin D drops on the basis of the control group as the observation group. The statistical results showed that the asthma symptom scores of the observation group were lower than those of the control group, and the significant treatment efficiency and total effective rate of the observation group were significantly higher than those of the control group [16]. The research results show that vitamin D joint glucocorticoid therapy can improve the clinical curative effect of patients with bronchial asthma and promote the improvement of the symptoms and lung function in patients with reply.

4.4. Combined Effect of Budesonide and Formoterol Powder Inhaler and Montelukast Sodium.

Budesonide and formoterol a very effective drugs for the treatment of asthma, but with the long-term use of inhalation, more adverse reactions, there is a certain harm to the body. Montelukast sodium can inhibit the release of inflammatory mediators by mast cells and improve the symptoms of asthma [19]. The following for budesonide mott joint lu meng LuSi sodium effect on the treatment of patients with A total of 98 patients with asthma in Luoshan County People's Hospital were divided into control group and observation group, 49 cases in each group. The two groups were given conventional treatment and budesonide and formoterol powder inhalation, and the observation group was given montelukast sodium chewable tablets. For the analysis of the results, the observation group was better than the control group in clinical efficacy, lung function index level, serological index level [19]. This demonstrates that the combination of budesonide and formoterol with montelukast sodium has a significant improvement in the treatment of asthma compared with budesonide alone [19].

5. Conclusion

Asthma, as a world widespread of respiratory disease, leads to asthma patient contact is a key factor for the allergen, followed by a variety of diseases caused by complications and a lack of vitamin D, and so on. Air pollution, pollen, dust mites, cold air can trigger asthma, etc. These factors can cause irritation to the patient's respiratory tract, and even cause respiratory inflammation. Allergens such as PM_{2.5} can also trigger allergic reactions in the body. Vitamin D controls the regulation of immune cells, and vitamin D deficiency will increase the inflammatory response of immune cells. These are all factors that contribute to asthma. For the treatment of asthma, there is currently a combination of glucocorticoid drugs and β -agonists, vitamin D, and montelukast sodium. It mainly inhibits the contraction of respiratory smooth muscle and acts on various receptors to inhibit the occurrence of asthma, which has a very excellent effect. Through the analysis of the above content, control the allergens is important factors, inhibition of treatment is temporary, when patients again after contact with the allergen still trigger asthma. Through the synthesis of allergens and their pathogenesis, it may provide a direction for the research and development of new drugs. The effect of vitamin D on asthma has been extensively mentioned in the previous article. The author believes that the new treatment can be considered around the direction of vitamin D and immunity. To sum up, the factors causing asthma are only mentioned in this paper, and the genetic aspects and the influence of other diseases still need to be supplemented. In the treatment of asthma, not only western

medicine, but also traditional Chinese medicine is an indispensable part. Asthma is widely distributed in the world, affecting 334 million people. Research into the pathogenesis of asthma and the development of new drugs is critical, and many people will benefit from it.

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