



Advanced Therapeutic Approaches Based on Nanotechnology that Target Interleukins in Chronic Respiratory Diseases

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Introduction

Chronic respiratory conditions, both communicable and non-communicable, are thought to be the leading cause of death, morbidity, economic and social pressures, and disability-adjusted life years (DALYs) worldwide. They have been responsible for the suffering of millions of people of all ages. Patients' health is compromised, and families and society suffer as a result, particularly in low- and middle-income nations. Different parts of the respiratory system, including the airways, parenchyma, and pulmonary vasculature, are affected by chronic respiratory diseases (CRDs). As the quantity of respiratory sicknesses is dramatically heightening yet at the same time the partners are not focusing towards its serious inconveniences. Rather than delivering the therapeutic agent to the target site for optimal care and prevention, the current treatment primarily focuses on relieving these illnesses' symptoms. In recent years, extensive research has been conducted on parenchymal rehabilitation, systemic inflammation of the airways and oxidative stress [1]. Where structural cells like fibroblasts, epithelial, endothelial, and smooth muscle cells, as well as macrophages, neutrophils, and T cells, have been identified as active participants in these chronic respiratory diseases. Cytokines, Chemokines, growth factors, and oxidants are some of the mediators and proteins that play a different role in the pathogenesis of each of these chronic respiratory diseases. Prescription drugs are currently being used to ease airway contraction and reduce airway inflammation. Cytokines have been found to play a crucial role in promoting chronic airway inflammation and re-modelling in all studies. Due to the limitations of conventional treatments, the purpose of this review is to provide a summary of the current understanding of the chronic respiratory disease and provide additional information regarding the various conventional treatments that are available for this condition [2]. In addition, it focuses on and discusses the cutting-edge drug delivery system being utilized to target interleukins for CRD treatment.

Description

All over the world, people's health is deteriorating and the number of CRD cases is rising at an exponential rate. Chronic respiratory diseases (CRDs), which have impacted the lives of over 1 billion people worldwide and are a major cause of morbidity and mortality, are becoming more common and burdensome. Worldwide, the severe level is due to the high prevalence of CRDs. CRDs were responsible for 39 million deaths in 2017, an increase of 18% from 1990, and 1470 DALYs per 100,000 people, or 112.3% more DALYs than in 1990 [3,4]. CRDs are now a major public health concern in every nation on the planet, particularly in developing nations and communities with limited resources. CRDs are becoming more common everywhere, primarily affecting children and the elderly. Pulmonary fibrosis, asthma, chronic obstructive pulmonary disease (COPD), acute respiratory distress syndrome (ARDS), are the respiratory diseases that have been the cause of more than 354 million deaths worldwide. The most prevalent CRDs are COPD (with a prevalence of 9% worldwide) and asthma (with 6%). Patients with CRDs, especially those with asthma and COPD, could anticipate an increase in SARS-CoV-2 and more severe COVID-19 infections.

Cytokines play a crucial role in the coordination of inflammation and immune responses. Cytokines are small regulatory proteins that are secreted and play an important role in the immune system. Multiple functions, such as cell proliferation, cell development, cell-to-cell communication, and the induction of gene expression, are all contributed to and controlled by cytokines. By binding to these receptors on the target cells, each cytokine functions; Depending on the kinds of cells that produce one cytokine and/or express their receptor, the mode of action can be autocrine, paracrine, or endocrine. By influencing and promoting interactions between cells, cytokines play a significant role in the development of chronic airway inflammation and re-modelling. Cytokine inhibitors play a crucial role in the organization and persistence of chronic airway inflammation. Aside from this, CRDs could be treated because interleukins (ILs) are involved in a variety of diseases and cellular processes [4,5].

Conclusion

Antibiotics, anti-inflammatory medications, corticosteroids, leukotriene pathway inhibitors (five-lipoxygenase inhibitors and antagonists of the leukotriene receptors), and bronchodilators are the traditional treatments for CRDs that are currently available on the market. These treatments aren't completely effective at getting rid of CRDs; instead, they cause certain side effects and sometimes make people addicted to steroids. Our systematic search for new targets and treatments for these respiratory disorders has been prompted by these complications. Due to these restrictions, pharmaceutical and academic researchers have prioritized the development of novel drugs. Another issue that has motivated researchers to investigate and develop new drugs is the problem of traditional drug adherence and tolerance. Recently, novel drug delivery systems have emerged as an effective strategy that is prominent enough to meet the requirements of the healthcare industry and also found to be effective in overcoming the limitations of conventional drug delivery systems. Nanotechnology and Nano science research and applications have made remarkable strides in recent years. The interest in cutting-edge nanotechnology-based progressive new drug delivery strategies has skyrocketed. In order to safely transport therapeutic agents within a specific organ, tissue, or cell compartment, nanoparticles are being considered. Recent advancements in nanoparticle technology have demonstrated

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tremendous potential as an innovative method of drug delivery.

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Conflict of Interest

None

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