Asthma is now one of the most serious diseases of civilization in the world. In Poland, approximately 4 million adults and children suffer from it and the number of patients continues to grow. Asthma is a chronic disease that may hinder or inhibit normal functioning. It causes inflammation (swelling) of the airways and their narrowing, impeding breathing. It can cause coughing, tightness in the chest and wheezing.

Exacerbations of asthma are characterized by increasing dyspnea, coughing, wheezing or feeling of tightness in the chest. One of the most common causes of acute exacerbations of asthma, which can be life threatening, are respiratory infections. It has been shown that the 85-95% exacerbations of asthma in children and 60% in adults is caused by viral infections, mostly rhinoviruses.

During common cold (caused by rhinovirus infection) the virus is usually found in the upper airways and deep in lung. In response, our body triggers the immune response, which generates blocking the spread of infection into the bronchi. However, if such a "emergency situation" lasts too long (chronic), it acts adversely and lead to permanent respiratory rebuild - remodeling. When remodeling appears, treatment with steroids and bronchodilators is extremely difficult, since changes in the airway inhibit reaction to medications thereby worsening the quality of life of the patients.

Therefore, the main objective of this project is an attempt to identify the target or targets for potential drugs to prevent or inhibit the process of airway remodeling.
The purpose of the proposal is analyze impact of human rhinovirus infection (types 16 and 2 - HRV16 and 2) on development and regulation of airway remodeling in cell culture models. In the project, agents directly or indirectly will be analyzed, associated with airway remodeling:
¬ TGF-β, MMP-9, Adam33, YKL-40 (compounds associated with the development and maintenance of airway remodeling)
¬ RXFP1 (relaxin receptor)
¬ I collagen (a protein that by building up, thickens the walls of bronchi).
α¬-SMA (marker of cells transition - fibroblasts into myofibroblasts (having the ability to shrink)
¬ LTC 4 synthase (marker of inflammation).

In addition, impact of chosen factors will be assessed:
¬ relaxin ((hormone with the ability to stimulate collagen degradation; the excessive amount of is produced in airway remodeling process)
¬ curcumin - a substance that according to scientific literature has anti-inflammatory properties and enhance immune system
¬ ciglitazone – agonist (compound stimulating) of PPAR-γ - transcription factor, involved in inflammatory processes and immune response.

After stimulation, the expression levels of the above genes and their protein products will be evaluated. In addition, we will analyze the genes expression in the cells from broncho-alveolar fluid of patients with asthma compared with non-asthmatic subjects.

Because airway remodeling has serious consequences for the functioning of patients with asthma, the study of this process seems necessary to facilitate the normal life of patients and reduce the symptoms of the disease. Research conducted in this area will help to broaden awareness and better understanding of airway remodeling mechanisms; The project may also lead in the future to development of a new group of drugs changing expression, activity and/or transport of the factors responsible for the remodeling process. In the available literature there is lack of reports concerning drugs that could inhibit the process of airway remodeling.
The project will enable a deeper look into pathways involved in asthma pathogenesis and thus fill an important gap in the current state of knowledge.