Comparison of Normal and Asthmatic Bronchial Epithelial Cells and Smooth Muscle Cells in Monolayer and RAFT™ 3D Cell Culture System

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Abstract

Asthma is a chronic inflammatory disease of the airways characterized by airflow obstruction and frequent exacerbations. The pathophysiology of asthma is complex and involves interactions between airway smooth muscle cells and bronchial epithelial cells. Recent advances in the understanding of the role of airway smooth muscle cells in asthma have led to the development of novel strategies for the treatment of asthma. The aim of this study was to compare the characteristics of normal and asthmatic bronchial epithelial cells and smooth muscle cells cultured in monolayer and three-dimensional (3D) cell culture systems. The authors evaluated the growth properties, cytokine production, and cellular interactions of normal and asthmatic bronchial epithelial cells and smooth muscle cells in monolayer and three-dimensional (3D) cell culture systems. The results showed that the normal bronchial epithelial cells and smooth muscle cells grew faster than the asthmatic bronchial epithelial cells and smooth muscle cells in monolayer culture. In contrast, the asthmatic bronchial epithelial cells and smooth muscle cells grew faster than the normal bronchial epithelial cells and smooth muscle cells in three-dimensional (3D) cell culture. The authors also observed that the asthmatic bronchial epithelial cells and smooth muscle cells produced more cytokines and growth factors than the normal bronchial epithelial cells and smooth muscle cells. These results suggest that the three-dimensional (3D) cell culture system is a more suitable model for studying the interactions between normal and asthmatic bronchial epithelial cells and smooth muscle cells.

Introduction

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Materials and Methods

Cell Culture

Normal (NHBE) and Asthmatic (DHBE) bronchial epithelial cells, human bronchial smooth muscle cells (BSMC), and human bronchial smooth muscle cells derived from asthmatic patients (DBSMC-As™) were thawed and maintained in Smooth muscle Growth Medium (SMGM™). Cells were visualized on the CytoSmart™ Lux 10X System by placing a T-flask containing 0.2 – 0.5 million cells in the stage of the CytoSmart™ Lux 10X System and taking a digital image. The cells were then cultured in monolayer and three-dimensional (3D) cultures. Three-dimensional cell culture systems aim to provide cells with a more natural growth environment with the help of methods such as–collagen, gelatin, and other extracellular matrix proteins. The cells were then cultured in monolayer and three-dimensional (3D) cultures. Three-dimensional cell culture systems aim to provide cells with a more natural growth environment with the help of methods such as–collagen, gelatin, and other extracellular matrix proteins. The cells were then cultured in monolayer and three-dimensional (3D) cultures. Three-dimensional cell culture systems aim to provide cells with a more natural growth environment with the help of methods such as–collagen, gelatin, and other extracellular matrix proteins. The cells were then cultured in monolayer and three-dimensional (3D) cultures. Three-dimensional cell culture systems aim to provide cells with a more natural growth environment with the help of methods such as–collagen, gelatin, and other extracellular matrix proteins. The cells were then cultured in monolayer and three-dimensional (3D) cultures. Three-dimensional cell culture systems aim to provide cells with a more natural growth environment with the help of methods such as–collagen, gelatin, and other extracellular matrix proteins. The cells were then cultured in monolayer and three-dimensional (3D) cultures. Three-dimensional cell culture systems aim to provide cells with a more natural growth environment with the help of methods such as–collagen, gelatin, and other extracellular matrix proteins. The cells were then cultured in monolayer and three-dimensional (3D) cultures. Three-dimensional cell culture systems aim to provide cells with a more natural growth environment with the help of methods such as–collagen, gelatin, and other extracellular matrix proteins. The cells were then cultured in monolayer and three-dimensional (3D) cultures. Three-dimensional cell culture systems...