Novel Voltage-Gated Potassium Channel Signaling Pathway and Asthma utilizing Bronchoscopy Data

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Asthma is a disease characterized by an excess of free-radical nitric oxide, NO, which leads to airway inflammation and obstruction. S-nitrosothiols (SNO's) are an important regulator in NO signaling, helping to relieve oxidative stress as well as bronchodilate and relax airway smooth muscle cells. SNO's exert most of their effects through the NO-cysteine interactions found particularly in S-nitrosocysteine (CSNO). The particular S-nitrosocysteine of interest in this paper is L-CSNO due to its ability to inhibit potassium channels associated with poor lung function, thereby improving ventilation in asthmatic patients. Potassium channels, amongst other ion channels as well, are a new target for therapeutic asthma treatment due to their ability to regulate vascular smooth muscle cells. KCN genes from bronchoscopy data from asthma and control patients were sequenced and analyzed against several measures for asthma and general lung function: asthma severity, FeNO, FEV1%, and androgen receptor gene expression. The goal of this study was to determine which KCN genes, and subsequent Kv channels, are associated with better lung function and which are associated with worse lung function/more severe asthma. The most beneficial KCN genes were found to be KCNA1 and KCNA4, whereas the KCN gene associated with the worst lung function was the KCNK6 gene family. Thus, a potential novel signaling pathway for asthma regulation may involve the binding of L-CSNO to the Kv channels encoded by the KCNK6 gene family in order to inactivate them and improve ventilation and overall lung function.