

1. Abstract

Idiopathic pulmonary fibrosis (IPF) is a chronic, progressive form of interstitial lung disease of unclear etiology. There are no effective therapies and the disease is uniformly fatal. Progression of the disease is classically characterized by episodic periods of rapid clinical decline, termed “acute exacerbations.” These exacerbations can result in worsened function, respiratory failure and even death. The triggers and the pathophysiologic mechanism for these devastating events remain unknown. Epidemiologic studies suggest an association between several environmental exposures and development of IPF. Limited data indicate an association between acute exacerbations of IPF and ozone air pollution. In addition, exacerbations occur with a winter predominance possibly reflecting contribution from wintertime particulate air pollution.

Air pollution influences symptoms, lung function, and exacerbations in many pulmonary diseases. Our studies in Salt Lake County have demonstrated that particulate pollution is associated with increased respiratory symptoms as well as decreased lung function in individuals with chronic obstructive pulmonary disease (COPD). In addition, both ozone and particulate air pollution result in increased nitrite in exhaled breath condensate in these individuals. The relationship between air pollution and symptoms, quality of life, exacerbations, lung function, and biomarkers of inflammation and oxidative stress remains largely unexplored in patients with IPF and has never been studied prospectively. It is unknown if air pollution has any impact on the progression of IPF.

We propose a pilot study to initiate research on the impact of air pollution on IPF. We will measure several important health outcome measures including daily respiratory symptoms, weekly assessment of lung function and quality of life, and biomarkers in serum and exhaled breath condensate. Exposure measurement will include indoor and outdoor air pollution exposure. Measurements of indoor air pollution is a particularly important aspect of this study based on the advanced age and/or poor functional status of many of these patients resulting in significant time spent within their homes. We hypothesize that increased short term levels of indoor and outdoor air pollution will be associated with increased respiratory symptoms, decreased quality of life, and decreased lung function in patients with IPF. Our ultimate goals are to provide insight into the effects of indoor and outdoor air pollution on idiopathic pulmonary fibrosis symptoms and progression and will provide the basis for future studies designed to elucidate mechanisms and risk factors for acute exacerbations. Further, the ability to determine the impact of a specific pollutant that can be avoided has tangible potential to alter the course of this devastating disease. In this interdisciplinary pilot study, we will demonstrate feasibility of measuring personal indoor and outdoor air pollution exposure as well as home measurements of symptoms and lung function. In addition, this pilot data will begin an understanding of associations between air pollution exposures and health effects in IPF.