**Effect of Atmospheric Smoke Particles and Soot on Lung Injury and IPF: mice and cell model research**

Chunlin Li1, Yang Hu2, Huiping Li2, Jianmin Chen1,\*

1 Shanghai Key Laboratory of Atmospheric Particle Pollution and Prevention (LAP3), Department of Environmental Science & Engineering, Fudan University, Shanghai 200433, China, 11110740002@fudan.edu.cn, jmchen@fudan.edu.cn

2 Department of Respiratory Medicine, Shanghai Pulmonary Hospital of Tongji University, Shanghai200433, China

**Abstract:** The relationship between atmospheric particle pollution and RSD (chronic and acute respiratory system disease) has been confirmed by many epidemiological and toxicologic studies (Delfino et al., 2005; Sarnat et al., 2008). With deterioration of atmospheric quality and increasing of aging population in China, morbidities in RSD have ballooned in the recent years, and IPF of high incidence draw great attention.(Kan et al., 2012) Chronic IPF (idiopathic pulmonary fibrosis) is a progressive, fatal, and untreatable lung disease of with unclear etiology(Kitamura et al., 2007; Wynn, 2011). In many clinical cases, BC particles were observed to be enriched in IPF fibroblasts or embedded in the nodes of pathological sections, and these BC particles were traced from ambient biofuel burning smoke and engine exhaust soot (Liu et al., 2011). However, causality between ambient BC particle exposure and IPF is obscure. Exposure experiment and toxicological stimulation experiment of smoke and soot particles using mice and cell models were performed to examine the effect on IPF and to explore the proper pathogenic mechanism.

Smoke particle and soot were produced from rice straw burning and diesel engine operation. Physiochemical properties including size distribution, chemical composition, and morphology of these particles were characterized prior the experiment. Mice (C57/BL) of pulmonary fibrosis were grouped and periodically exposured to high concentration smoke particles or particle-free air in a toxicant exposure cabinet for one or four weeks. The changes in lung function and pathology over this time course were assessed, with measurements of cytokines in broncho-alveolar lavage (BAL), hydroxyprolin, and Smad/p-Smad proteins content in lung tissue. Precisely quantified soot particles in four concentration gradients were used to stimulate the cultivated mice macrophage cell (RAW 246.7) for 2 to 12 h with time gradient of 2 h. Cell proliferation and decay were monitored using Cell-IQ, supernatant cytokines and cell lysates of Smad/p-Smad proteins, SOD content were quantitatively determined. Our results show that smoke particle exposure exacerbate IPF and inflammation symptom of mice. From pathogenic slice of lung tissues and lavage cytokines analysis, inflammatory cell and collagan fiber deposition increased so as the cytokines of IL-6, TNF-α, and TGF-β in response to exposure. More Smad/p-Smad expression level also indicated TGF-β is activated. To the cell stimulation experiment, macrophages engulfed soot particles to induce enhanced intracellular oxidative pressure and inflammatory response, and dosage dependent manner was observed. Cytokines like IL-6, TNF-α, and TGF-β increased, implicating a potential risk in fibrosis.