

## Effects of Asian Sand Dust on Respiratory Health

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The Asian Sand Dust (ASD) aerosol spreads over large areas, including East China, the Korean Peninsula, Japan and the United States [1]. ASD contains a variety of chemical species, such as Sulfate ( $\text{SO}_4^{2-}$ ) and Nitrate ( $\text{NO}_3^-$ ) derived from air pollutants ( $\text{SO}_2$ ,  $\text{NO}_2$ ), as well as microbial agents, such as bacteria, fungi, and viruses [2,3]. About 53% to 71% of the pollutants in ASD are of less than 10  $\mu\text{m}$  in diameter (PM<sub>10</sub>), and those particles can reach the lower respiratory tract, causing inflammatory and allergic diseases. Therefore, hazardous effects of ASD aerosol on human respiratory health are becoming a serious concern in China and neighboring countries.

Since ASD adsorbs many kinds of microorganisms including highly pathogenic bacteria or viruses, it may result in exacerbation of pneumonia by the pathogens. Indeed, epidemiologic studies have demonstrated that dust storm events caused an increase of hospitalization for pneumonia in China [4]. Studies have shown that intratracheal instillation of ASD caused bronchitis and alveolitis, whereas ASD heated at 360°C (to exclude toxic materials such as microbiological materials, etc.) caused considerably fewer effects [5]. These results suggest that the microbial components attached to ASD play an important role in the lung inflammation caused by ASD. Another study further demonstrated that administration of ASD exacerbates pneumonia incidence in *Klebsiella pneumoniae* infected mice, which is evidenced by cellular profiles of BALF and pathological examinations [6].

ASD has also been associated with allergic diseases. For example, there are several reports on the exacerbation of Japanese cedar pollinosis and seasonal allergic rhinitis as well as of adult and child asthma occurring during dust storm events [7,8]. Results from a study demonstrated that the mineralogical components of ASD particles, free from chemical and biological pollutants, caused acute inflammatory changes in the lung tissue and BALF in vivo [9]. Another study suggests that ASD can aggravate airway disease by activating inflammatory reactions through increased mucus secretion [10].

In conclusion, atmospheric exposure to sand dust containing pathogens as well as mineralogical components could present a significant threat to human respiratory health. Thus, enforcement of air quality regulations should be strengthened in both China and other countries in order to prevent further deterioration of the already devastating ASD.

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