Short term inhalation exposure to silica aerosol on respiratory parameters monitored by online computer programme in mice

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Silicosis or pulmonary fibrosis is caused by inhaling dusty air polluted with silica. It is an occupational hazard for workers in construction industry as well as mining. While there are studies available on long term exposure to such dust, reports on short term exposure are scarce. Hence, in the present study, we exposed mice to silica aerosol repeatedly and monitored the respiratory parameters during inhalation by online computer programme for short term. Mice were exposed in a head-out-body-plethysmograph to 150 mg m^{-3} of silica aerosol generated by an airblast nebulizer for 4 h and for 5 days continuously. The respiratory changes were monitored by a volumetric pressure transducer and analyzed by an online computer programme capable of quantifying the breathing pattern and the respiratory variables. Immediately after the start of silica inhalation the normal breathing pattern decreased and airway obstruction pattern increased. There was no sensory or pulmonary irritation pattern. Correspondingly, the frequency increased and the tidal volume decreased. After the end of inhalation exposure, only partial recovery was observed. On the next day, the respiratory frequency was increased and the tidal volume decreased before the start of silica inhalation compared to the previous day. Following exposure to silica on subsequent days the respiratory frequency further increased and the tidal volume decreased. This study shows that silica aerosol inhalation can cause an immediate change in the respiratory variables with an increase in the respiratory frequency and decrease in tidal volume (rapid shallow breathing), and a breathing pattern of airway obstruction.

Keywords: Air pollution, Airway obstruction, Mining, Pulmonary fibrosis, Short term exposure, Silicosis