

RESPIRATORY CONSEQUENCES OF RED SLUDGE DUST INHALATION IN RATS

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The environmental disaster following flooding by red sludge in the Ajka region in Hungary poses a serious public health threat with particular concern regarding the potentially adverse respiratory effects of the inhalation of red sludge dust (RSD). The respiratory consequences of the inhalation of RSD obtained from field samples were investigated in rats. Rats were either exposed to RSD at a high concentration (2 weeks, 8 hours/day), or kept in room air. After the exposures, the airway resistance (Raw) and the respiratory tissues mechanics were measured under baseline condition, and following methacholine (MCh) challenges with the aim of establishing airway hyperresponsiveness (AH). Histopathology was performed to assess lung morphologic alterations. The physical properties and the chemical composition of the RSD were also characterized. The size distribution, chemical composition and topology of the RSD particles applied in our experiments were similar to those observed at the site of the disaster. The inhalation of RSD did not alter the basal respiratory mechanics (Raw values of 79.2 ± 16.3 vs. 75.6 ± 20.1 cmH₂O.s/l in control and RSD exposed rats, respectively; $p=0.65$), whereas it led to greater MCh-induced responses in Raw (744 ± 452 vs. 1087 ± 261 cmH₂O.s/l at the highest MCh dose, $p<0.005$), demonstrating the progression of mild AH. Histopathological investigations revealed fine, granular particles in the alveolar macrophages, as evidence that RSD had reached the lower respiratory tract and induced mild inflammation around the alveoli and the pulmonary vasculature. The mild respiratory symptoms that developed following short-term exposure of healthy individuals to high concentrations of airborne RSD do not appear to pose a greater respiratory hazard than the inhalation of urban dust at a comparable concentration.

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