ASSESSMENT OF DUST EMISSIONS AT NELLIS DUNES RECREATION AREA, NEVADA, USA: PRELUDE TO A HUMAN HEALTH RISK ASSESSMENT

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In the USA, the largest single source of both PM10 and PM2.5 is road dust (EPA, 2005). For over 40 years, the Nellis Dunes Recreation Area (NDRA) has been heavily used for off-road vehicle (ORV) recreation with an estimated 300,000+ drivers per year (Goossens and Buck, 2009). A map of NDRA was created and contains 17 surface units based on textural composition, surface crusts, rock cover, and vegetation (McLaurin et al., 2011). Natural and ORV-generated dust emissions were measured. Wind erosion is greatest in the sandy areas, ORV emissions are greatest in the silty and rock-covered areas. Emissions from ORV activities increase exponentially with driving speed, and are highest for 4wheelers. On an annual basis, ORV-generated emissions equal natural dust emissions. Dust containing palygorskite is of concern because it commonly crystallizes in an asbestiform morphology and is found in all but 2 map units. Extremely high concentrations of naturally-occurring arsenic were found. To our knowledge, no previous study has reported As concentrations in airborne dust from natural surfaces as high as those found in this study: PM10 up to 290 ppm; PM60 up to 312 ppm. Water-soluble arsenic is as high as 14.7 ppm. Emission rates for arsenic were calculated for all surface units. Sandy areas have the potential to emit the greatest amount of arsenic-containing dust during windy conditions, whereas specific silt, rock-covered, and silty sand units have the highest arsenic emissions during ORV activities. In vivo experiments were conducted in mice to examine the immunotoxicological and histopathological effects following 3 daily exposures to dust samples from 3 map units. Suppression of humoral immunity and splenic T-lymphocytes were the most sensitive parameters affected. Toxicology and human exposure data will be collected to define site-specific parameters for probabilistic modeling of human health risks.

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