Martian and Asteroid Dusts as Toxicological Risks for Human Exploration Missions

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As the lunar dust toxicity project winds down, our attention is drawn to the potential toxicity of dust present at the surface of more distant celestial objects. Lunar dust has proven to be surprisingly toxic to the respiratory systems of test animals, so one might expect dust from other celestial bodies to hold toxicological surprises for us. At this point all one can do is consider what *should* be known about these dusts to characterize their toxicity, and then ask to what extent that information *is* known. In an ideal world it might be possible to suggest an exposure standard based on the known properties of a celestial dust without direct testing of the dust in laboratory animals. Factors known to affect the toxicity of mineral dusts under some conditions include the following: particle size distribution, particle shape/porosity, mineralogical properties (crystalline vs. amorphous), chemical properties and composition, and surface reactivity. Data from a recent Japanese mission to the S-type asteroid Itokawa revealed some surprises about the dust found there, given that there is only a very week gravitational field to hold the dust on the surface. On Mars the reddish-brown dust is widely distributed by global dust storms and by local clusters of dust devils. Past surface probes have revealed some of the properties of dust found there. Contemporary data from Curiosity and other surface probes will be weighed against the data needed to set a defensible safe exposure limit. Gaps will emerge.