Martian Dust Toxicity: the Problem is in the Perchlorate

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The discovery of perchlorates on Mars is relevant for human exploration both in terms of *in situ* resource utilization and the potential human health effects [1]. Like lunar dust exposure during Apollo missions, human contact with Mars dust is expected in future Mars missions. Physiological risks associated with human exposure to Mars dust ranges from respiratory to abrasive affects, and warrants detailed characterization. In this paper, we present an approach to characterize the potential toxic effects that perchlorate-rich Mars dusts may have on future human explorers.

Utilizing a model similar to that used to establish the current NASA permissible exposure limit for astronauts to lunar dust, we propose the formation of a Mars Perchlorate Toxicity Assessment Group (MAPTAG), specifically charged to establish a permissible exposure limit for astronauts to Mars perchlorate. Ideally, MAPTAG would be modelled after actual Lunar dust exposure levels by Apollo astronauts, assuming that Martian dust is the main vector by which astronauts would be exposed to perchlorate. Perchlorate rich Mars simulants with a composition that is agreed upon by the scientific community could be used in a variety of studies that characterize the links between dust particle size, chemical reactivity, and their effects in biological systems. Similar to the studies performed by the Lunar Airborne Dust Toxisity Assessment Group, MAPTAG would perform laboratory investigations that use cellular assays, intratracheal instillation techniques, and or inhallation technologies to expose tissue cultures and model organisms to Mars-like, perchlorate-rich dusts or simulants. Biological responsiveness would be quantified, and would drive engineering and operational solutions designed to reduce human physiological risks associated with exposure to the perchlorate-rich dusts on Mars.

[1] Davila et al (2013) Intl Journal Astrobiology, vol 12., issue 4, pp. 321-325.