Pulmonary Inflammatory Responses to Acute Meteorite Dust Exposures – Implications for Human Space Exploration

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New initiatives to begin lunar and martian colonization within the next few decades are illustrative of the resurgence of interest in space travel. One of NASA's major concerns with extended human space exploration is the inadvertent and repeated exposure to unknown dust. This highly interdisciplinary study evaluates both the geochemical reactivity (e.g. iron solubility and acellular reactive oxygen species (ROS) generation) and the relative toxicity (e.g. *in vitro* and *in vivo* pulmonary inflammation) of six meteorite samples representing either basalt or regolith breccia on the surface of the Moon, Mars, and Asteroid 4Vesta. Terrestrial mid-ocean ridge basalt (MORB) is also used for comparison.

The MORB demonstrated higher geochemical reactivity than most of the meteorite samples but caused the lowest acute pulmonary inflammation (API). Notably, the two martian meteorites generated some of the highest API but only the basaltic sample is significantly reactive geochemically. Furthermore, while there is a correlation between a meteorite's soluble iron content and its ability to generate acellular ROS, there is no direct correlation between a particle's ability to generate ROS acellularly and its ability to generate API. However, assorted *in vivo* API markers did demonstrate strong positive correlations with increasing bulk Fenton metal content.

In summary, this comprehensive dataset allows for not only the toxicological evaluation of astromaterials but also clarifies important correlations between geochemistry and health.