The LADTAG-RWG is a multi-disciplinary group of scientists organized in September 2005 to investigate the problem of lunar dust effects on crew health. The LADTAG itself consists of representatives from the LADTAG-RWG plus a number of experts from outside the NASA community. Toxicologists, lunar geologists, physicians, biologists, flight surgeons, astronauts (contemporary and Apollo-era), chemists, and aerosol physicists comprise the LADTAG. It is responsible for delivering to NASA’s Office of the Chief Health and Medical officer (OCHMO) inhalation exposure limits for lunar dusts. LADTAG is also working to establish non pulmonary standards and human health risk criteria for dermal and ocular exposure.

The RWG’s principal interest is to understand the biological effects of lunar dusts. However, the group also recognizes the need to understand several non-biological issues such as: dust settling times in a lunar habitat, dust surface activation and how to characterize it, particle size distribution, geologic differences between dust from different regions of the Moon, the effects of vapor-phase condensation on the dust surfaces, and charging effects on lunar dust at the terminator.

The RWG is being led out of Johnson Space Center (JSC) and Ames Research Center (ARC) with support institutes as follows:

- Space Life Sciences Directorate (JSC);
- Space Biosciences Division (ARC);
- Dermatology and Biomedical Engineering at Oregon Health & Sciences University;
- Planetary Geosciences Institute at The University of Tennessee, Knoxville;
- Lunar and Planetary Institute; Houston, TX
- Planetary Science Institute in collaboration with the University of Wisconsin.

The project is managed through the Advance Environmental Health Project, part of the Human Research Program headquartered at NASA JSC.

Active research began in 2006 and is ongoing. Preliminary results for pulmonary studies are expected later in 2008. A final inhalation exposure standard (permissible exposure limit) is expected to be delivered to NASA’s Office of Chief Health and Medical officer no later than 2010. LADTAG is also working to understand dermal and ocular health effects in order to provide a complete picture of the potential impact to astronaut health.

The long term health effects of lunar dust exposure are unknown. One can speculate, based on earth-based analogues, that mineral dusts are not especially toxic; however, a sizable body of evidence indicates that dust exposure on Earth can be deleterious to human health. Lunar dusts are of particular concern because, when compared to typical Earth dusts, they have more reactive surfaces, they have a higher content of metallic iron, and they have a larger surface area (are porous). The field of air pollution research suggests that dust smaller than 10 µm enters into the lungs and leads to an increased risk of lung disease and heart related conditions such as strokes and heart attacks [1]. However, air pollution dust tends to be composed of particles that have smooth surfaces. By contrast, lunar dust is composed of agglutinates with sharp jagged edges that may be more potent triggers of pulmonary inflammation and other pathophysiological processes.

Even with carefully designed environmental control systems, it is highly likely that lunar dust will find entry routes into the habitat or EVA suits during long duration exploration of the Moon. Therefore it is critical that we understand the health effects of lunar dust and develop mitigation strategies for managing the problems associated with lunar dust exposure.

Who to contact with further questions?
John James: john.t.james@nasa.gov
Russell Kerschmann: russell.l.kerschmann@nasa.gov

Reference Documents:


Lunar Dust Relevant to Astronauts. *LPSC XXXIX* Abstract # 2541.


