Spaceflight Toxicology

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Mission

• To protect crews from toxic exposures during spaceflight
Assessing Health Hazards

- Payload chemicals
  - Composition
  - Concentration
  - Volume
- Irritancy Potential
  - Eye
  - Respiratory
  - Skin
## Toxicological Hazard Levels

<table>
<thead>
<tr>
<th>Hazard Level</th>
<th>Irritancy</th>
<th>Systemic Effects</th>
<th>Containability</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Slight-lasts &lt;30 min-no therapy</td>
<td>None</td>
<td>+/-</td>
</tr>
<tr>
<td>1</td>
<td>Slight to moderate-lasts &gt;30 min-therapy</td>
<td>Minimal effects-no potential for long-term effects</td>
<td>+/-  Surgical masks, gloves, goggles</td>
</tr>
<tr>
<td>2</td>
<td>Moderate to severe-possible long-term effects</td>
<td>Minimal effects-no potential for long-term effects</td>
<td>+  Surgical masks, gloves, goggles</td>
</tr>
<tr>
<td>3</td>
<td>Moderate to severe-possible long-term effects</td>
<td>Appreciable effects-potential for long-term effects</td>
<td>+  Quick-don masks and gloves</td>
</tr>
<tr>
<td>4</td>
<td>Moderate to severe-possible long-term effects</td>
<td>Appreciable effects-potential for long-term effects</td>
<td>-  Quick-don masks and ARS or evacuation</td>
</tr>
</tbody>
</table>
Setting Limits

• Spacecraft Maximum Achievable Concentrations (SMACs)
• Spacecraft Water Exposure Guidelines (SWEGs)
Offgas Testing

- "Materials used in habitable areas of spacecraft, including the materials of the spacecraft, stowed equipment, and experiments, must be evaluated for flammability, odor, and offgassing characteristics".
Monitoring

• Real-time
  – CO2
  – Formaldehyde badges
  – compound specific analyzer for combustion products (CSA-CP)

• Post-flight
  – Grab sample containers
Lunar Airborne Dust Toxicity Advisory Group

- Formed in 2005 to address the problem of setting health standards for astronaut exposure to lunar dust
- Animal instillation experiments
http://microgravityuniversity.jsc.nasa.gov/