Occupational Space Medicine

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Learning Objectives

• 1) Understand the unique work environment of astronauts.
• 2) Understand the effect microgravity has on human physiology
• 3) Understand how NASA Space Medicine Division is mitigating the health risks of space missions.
Space Environment

- Reduced Gravity
- Radiation
- Vacuum
- Debris
- Temperature extremes
Space Craft Environment

- Isolation and confinement
- Noise and Vibration
- Closed loop environment (life support)
- Payloads and construction activities
- Waste production
Space Flight Mission

- Flight activity Launch and Reentry Forces
- Remoteness and communication access
- Circadian rhythms and crew schedule changes
- ExtraVehicular Activity (EVA)
Occupational Space Medicine

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Your Health is Our Mission
Medical Versus Occupational Surveillance

• Medical- What risks you bring to the table (cholesterol, hypertension, etc)

• Occupational- What risks you come away with a result of the occupation

Your Health is Our Mission
The Work Environment

Your Health is Our Mission
Controls

• OSHA and NIOSH do not dictate controls or reporting for space work

• Ethical and moral obligation to perform surveillance, but no legal obligation currently

Your Health is Our Mission
Occupational Hazards in Space

- Radiation of the Space Variety
- Microgravity
- Circadian Rhythm Disruption
- Noise
- Carbon Dioxide
- Lasers
- Rocket propellants

From Scientific American

Your Health is Our Mission
Lifetime Surveillance of Astronaut Health (LSAH)

- Benchmarked off of similar programs in DoD and the Department of Energy
- Allows insight into long-term sequelae from exposures in the workplace

Your Health is Our Mission
NASA Human Research Program (HRP)

Research Data Repository: Life Sciences Data Archive (LSDA)

NASA Space Medicine

Medical Data Repository: Lifetime Surveillance of Astronaut Health (LSAH)

The Lifetime Surveillance of Astronaut Health (LSAH) is a proactive occupational surveillance program for the astronaut corps to screen and monitor astronauts for occupational related disease. The LSAH Repository (LSAH-R) was established to implement a research component to enable analysis of astronaut medical data.

More about LSAH: [LSAH Home] [Publicly Available Information & Data]

Missions or Studies in Progress

Campaign 17 [Learn more]  ECP [Learn more]  ROI [Learn more]  Campaign 11 [Learn more]  Expedition 30 [Learn more]
Brief History of Longitudinal Study of Astronaut Health

- Phase 1
- Phase 2
- Workforce controls for comparison
- Low Statistical Power
- No Consent
Institute of Medicine Recommendations

1. Must serve two sometimes conflicting goals of research and occupational surveillance...

2. No comparison group can meet every goal or need, it should be individualized...

3. Increase the quality and quantity of preventive care to increase the data...

4. NASA should assume responsibility for the lifelong health care of its active and former astronauts.
New LSAH

• Preventive Medicine Protocols
  ➢ Age Based (40, 45, 50, 60, etc)
  ➢ Ultrasound
  ➢ Mammography
  ➢ MRI
  ➢ Colonoscopy
  ➢ Stress Test
  ➢ Complete Physicals
  ➢ Derm Surveys
  ➢ DEXA
  ➢ Etc, etc.

• Occupational Health Surveillance Protocols
  ➢ Radiation
  ➢ Bone
  ➢ Eye
  ➢ Cadmium
  ➢ Hydrazine
  ➢ Lead
  ➢ etc, etc.
### Improving the Research

<table>
<thead>
<tr>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Query the data and compare to 3 NASA workers for each astronaut....</td>
<td>Query the database and find the best comparison group to answer the question being asked</td>
</tr>
<tr>
<td>No consent obtained, just implied.</td>
<td>Much more statistically powerful.</td>
</tr>
<tr>
<td>Poor statistical power.</td>
<td>Consent for direct studies, no consent needed for generic occ health trends.</td>
</tr>
<tr>
<td>No flight data incorporated!!!</td>
<td>Flight data incorporated.</td>
</tr>
</tbody>
</table>
Identifying long term health risks and employing preventive medicine

Your Health is Our Mission
Occupational Surveillance for Spaceflight

- Meets Ethical and Moral obligation
- Increases data available to research
- Identifies and prevents exposure related disease
- Allows feedback into spacecraft design
- Allows NASA to follow long term health impacts

Your Health is Our Mission