The Need for an Aerospace Pharmacy Residency

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Introduction:

- Aerospace medicine provides a unique twist on traditional medicine.
- A subspecialty for physicians exists to care for the altered body systems as a result of extreme environments.
- Pharmacy practice has expanded to accommodate specialized medicine through pharmacy residencies.
- No formal training in aerospace medicine currently exists for pharmacists.
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• Time and resources are committed behind the scenes that require an understanding of pharmaceutical science and an understanding of all the aspects of flight. *Integration*

• The range is virtually unlimited:
  – undersea/recompression/HBO to long duration space flight.
  – NOMI, Brooks, NASA, and virtually every country represented in AsMA has some form of a Pharmacy and Therapeutics committee to determine not only safe use of drugs in aerospace for physical ailments, but also performance “management.”
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• An understanding of the changes to the body and body systems as it relates to pharmacy is necessary by the profession.
  – *Patient Care, Pharmacovigilance and DI*

• Providing an Aerospace Pharmacy residency would accomplish this task and allow pharmacists to provide better care for aerospace and space travelers in both government and civilian programs.
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Method

• A review of the topics in aerospace medicine that involve pharmacy was conducted.

• Pharmacy practice areas embedded within aerospace medicine are identified.
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• Deficits in current pharmacy curriculum identified
  – Physiological changes to body in microgravity
  – Changes to pharmacokinetics and pharmacodynamics
  – Pharmaceutics issues
    • Fluid properties in zero G
  – Drug delivery systems
  – Interpretation of pharmacy law
Aerospace Physiologic Changes Not Addressed in Current Pharmacy School Curriculum

• Pathophysiology of the body *(Patient Care, Pharmacovigilance, DI, Commercial Space Travel)*
  – Understanding of all altered body systems important for pharmacist to understand in order to provide best treatment options
  – Altered blood volume – pharmacokinetics?
  – Altered hepatic/renal fxn – therapeutics?
    • Biodynamics of acceleration
    • Aerospace otolaryngology
    • Aerospace ophthalmology
    • Aerospace cardiology
    • Aerospace neurology
    • Aerospace nephrology

• Radiation biology
  – Effects on body, what about drugs?
Aerospace Physiologic Changes Not Addressed in Current Pharmacy School Curriculum

• Pharmacotherapy of:
  – Hypoxia at Altitude
  – Mountain Sickness
  – Dysbarism
  – Microgravity/Neurovestibular Effects
  – Motion sickness

• Balance between countermeasures and other medications.
Aerospace Medicine Issues Not Addressed in Current Pharmacy School Curriculum

- **Pharmaceutics** *(Patient Care, Pharmacovigilance, DI, Commercial space travel)*
  - Altered Atmospheres
    - Fluid mechanics of meds?
    - Drug delivery systems?
- **Accident Investigation** *(Pharmacovigilance)*
  - Toxicology/drug review?
- **Mission performance** *(Pharmacovigilance)*
  - DNIF or not DNIF
- **History of aerospace medicine**
  - Medical support for military aerospace medicine
  - Medical Support of Mercury, Gemini, Apollo, Skylab and Mir
    - Historical perspective provides insight into current and future issues
- **Current topics**
  - ISS Medical Operations
    - Med kit design
    - Treatment options and medications chosen
  - Space Shuttle Operations
- **Future topics** *(Commercial space travel)*
  - Commercial space flight
    - A changing population of space travelers
• Areas for pharmacist involvement
  – Pharmacy and therapeutics committees
  – Counseling for drug delivery systems
  – Consultation for altered PK/PD
  – Research guidance

• Future involvement within the military, government sponsored aerospace programs and commercial space tourism emphasizes the need for an aerospace pharmacy residency.
• Challenges
  – Currently, limited pharmacist involvement in field.
  – Lack of information as it pertains to the pharmacokinetics and pharmacodynamic research.
  – Identifying a university partner.
    • Creating a piggyback program to an existing aerospace medicine residency.
  – Navigating through credentialing process