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.”
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
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• 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.
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• 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