The Need for an Aerospace Pharmacy Residency

T. Bayuse1, C. Schuyler2
1 Wyle Laboratories NASA Johnson Space Center,
Houston TX
2 NATO, Joint Force Command, AF South, Naples, Italy

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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.
Method

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

• Pharmacy practice areas embedded within aerospace medicine are identified.
• 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