

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.

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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

- Pharmaceuticals (*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

Integration

**Commercial
Space Travel**

Patient Care

**Drug
Information**

Pharmacovigilance



Pharmacist

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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