to any observed genetic, proteomic or metabolomics changes. Space radiation and duration in space, (microgravity and confinement) will be the major variables to be analyzed. The Inspiration Mars personalized medicine program (astro-omics) will include pharmaco-astro-genomics, informed interventions to mitigate radiation effects, optimization of sleep and circadian rhythms, as well as the development of disease susceptibility mitigation approaches. Personalized medicine countermeasures will be operationally deployed to mitigate health effects and manage unanticipated medical contingencies, and will also be used to monitor astronauts post-flight for early detection of cancer as well as other degenerative diseases.

Learning Objectives:

1. Understand the challenges of humans on a long duration deep space mission
2. Understand the components of a personalized medicine program
3. Understand the application of a personalized medicine program to risk mitigation
4. Understand the operational implementation of a personalized medicine program

[050] NON-INVASIVE BRAIN MONITORING CAPABILITIES DEVELOPED BY THE NSBRI: SPACE MEDICINE NEEDS DRIVING NEUROCRITICAL CARE ADVANCES

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[1]Baylor College of Medicine, Houston, TX, [2]Department of Neurology and Center for Space Medicine, Baylor College of Medicine, Houston, TX

INTRODUCTION: Astronauts have exhibited ocular pathologies that have on Earth been associated with increased intracranial pressure (ICP). To safeguard brain health and to determine whether ICP is elevated during spaceflight, NSBRI is supporting the development and the clinical validation of a number of innovative non-invasive diagnostic devices. **METHODS:** ICP measurements as assessed by non-invasive modalities are being directly and simultaneously compared to absolute ICP as determined by invasive methods (lumbar puncture, spinal catheter or via an existing shunt reservoir) in hydrocephalus or idiopathic intracranial hypertension patients. The following non-invasive devices are being evaluated: Cerebral Cochlear Fluid Pressure (CCFP) Analyser, the Distortion Product OtoAcoustic Emissions Device, and the Two-Depth Transcranial Doppler Device (Vittamed 205). In addition, the Institute is supporting the validation of a novel non-invasive device that uses magnetic induction phase-shift spectroscopy to assess small changes in cerebral fluid volume. Finally, NSBRI has partnered with GE to develop a 3-D ophthalmic ultrasound probe and imaging software that will non-invasively and indirectly monitor ICP by detecting alterations in ocular structures and blood flow in the retinal vessels. **RESULTS:** These devices appear to be sensitive to physical perturbations that would affect ICP. In addition to assessing accuracy and reliability, the teams are developing standardized methods for scanning and training as well as working with the inventors to optimize the hardware and software for use in spaceflight. We will present preliminary observations on the feasibility of using these devices for assessing astronaut brain health during spaceflight. **DISCUSSION:** Two million patients are admitted to the hospital every year after strokes or brain trauma. CT, MRI and other standard imaging techniques provide non-invasive snapshots of cerebral conditions. Invasive intracranial pressure monitors pose some risk so are only used in the most serious cases. Most patients are left largely unmonitored for changes in ICP or cerebral fluid, putting them at risk to develop irreversible brain insults and neurological deficits. The non-invasive devices being developed for the manned spaceflight program have the potential to transform neurocritical care and improve patient outcomes.

Learning Objectives:

1. Understanding the use of non-invasive devices to monitor brain health
2. Understand how the needs of manned spaceflight are driving innovation for neurocritical care

Monday, May 12 ***10:30 AM***
Indigo B & F

[IX] HYPOXIA AND ACCELERATION

Sponsored by the AsMA Associate Fellows Group

Moderator: K. Ruskin
Yale University School of Medicine, New Haven, CT

Moderator: S. Gaydos
Army Air Corps, Army Aviation Centre, Middle Wallop, Hampshire UK

PANEL OVERVIEW: The Associate Fellows Group panel covers topics related to hypoxia, including hypoxic hypoxia, stagnant hypoxia due to acceleration, and hypemic hypoxia caused by anemia. The detrimental effects of hypoxic hypoxia at moderate pressure altitudes are not as well understood and are less predictable than those of high altitude. They are also subtler and are subject to greater inter-individual variability. These effects may still present a significant hazard to aircrew operating in an unpressurized cabin without supplemental oxygen, increasing the likelihood of an accident or incident. The second topic of discussion will be a comparison between a portable oxygen delivery system consisting of a pneumatic regulator with pulse dose and constant flow settings and the physiological protection provided by an alternative system that incorporates an electronic pulse dose regulator. Both systems were assessed using oro-nasal masks with volunteers at rest, during exercise, and speech. Topics related to acceleration will include the effect of anti-G trousers on the cerebrovascular response to +Gz and the correlation between measures of cerebral oxygenation and perfusion and G tolerance. The results of a study regarding assessment of +Gz protection using a photoplethysmographic waveform obtained from the ear will also be presented. The last presentation will be an informational discussion of the physiologic effects of anemia and the advantages and disadvantages of a restrictive transfusion protocol.

[051] MILD HYPOXIA BEYOND THE AIRCRAFT CABIN

T. Smith
University of Oxford, Oxford, United Kingdom

INTRODUCTION: Commercial airline passengers and crew experience cabin pressures equivalent to altitudes of up to 8,000 ft, which is comparable to breathing approximately 15% oxygen at sea level. While this mild hypoxia is benign for the vast majority of the population, it nevertheless provokes physiological responses that can be clinically relevant in some individuals. A similar degree of hypoxia is encountered in many other situations which provide insights into the associated physiology. These include populations who reside at altitudes of around 8,000 ft, athletes undergoing altitude training, patients with chronic respiratory disease, and workers exposed to hypoxic fire prevention systems in the industrial setting. This presentation will explore the broader field of mild hypoxia physiology and consider the aircraft cabin environment and its effects within this context.

Learning Objectives:

1. Broaden understanding of hypoxia physiology

[052] ROTARY-WING MISHAP DEMONSTRATING UNTOWARD EFFECTS OF HYPOXIC HYPOXIA AT MODERATE ALTITUDE

C. Goldie, I. Curry, S. Gaydos
Army Air Corps, Army Aviation Centre, Middle Wallop, Hampshire, United Kingdom

INTRODUCTION: The detrimental effects of hypoxic hypoxia at moderate pressure altitudes (<15,000 ft / 4572 m) are not as well-characterized, are less predictable, and demonstrate subtlety and greater inter-individual variability when compared to high altitudes. Yet, these effects may still present a significant hazard to unpressurized aircrew operating without supplemental oxygen. **METHODS:** We present a case report of a rotary-wing (RW) mishap that occurred at altitude during a casualty evacuation mission to a meteorological station on Mt. Kenya. **RESULTS:** This case report highlights several important issues related to