
Welford C. Roberts, Ph.D. (Editor)

US Air Force, Medical Service, Medical Research, Operational Medicine, Enroute Care, Force Health Protection, Nursing

Approved for Public Release; distribution is unlimited

The U.S. Air Force Medical Service presented the fifth annual Air Force Medical Research Symposium coordinated by the Air Force Medical Support Agency’s Research and Development Division (AFMSA/SGRS). The symposium was held 24-26 August 2010 at the Doubletree Hotel Washington DC – Crystal City, Arlington, VA. The symposium featured two half-days of plenary sessions, one and a half days of scientific presentations, and a poster session. It was organized into four tracks to include: Operational & Medical, Enroute Care, Force Health Protection, and Nursing. These proceedings are organized into five volumes to include one that provides a general overview and all presentation and poster abstracts; the other four each address a specific track. Volume 1 contains a general overview of the entire 2010 Air Force Medical Research Symposium and includes abstracts of all the oral presentations and posters, information and presentations from the opening and closing plenary sessions, symposium agenda, and attendee list.
1. REPORT DATE  
15 MAR 2011

2. REPORT TYPE 

3. DATES COVERED 
24-08-2010 to 26-08-2010

4. TITLE AND SUBTITLE  

5a. CONTRACT NUMBER 

5b. GRANT NUMBER 

5c. PROGRAM ELEMENT NUMBER 

5d. PROJECT NUMBER 

5e. TASK NUMBER 

5f. WORK UNIT NUMBER 

6. AUTHOR(S) 

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) 
US Air Force Office of the Surgeon General, AF/SG9S, 5201 Leesburg Pike, Falls Church, VA, 22041

8. PERFORMING ORGANIZATION REPORT NUMBER 

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) 

10. SPONSOR/MONITOR’S ACRONYM(S) 

11. SPONSOR/MONITOR’S REPORT NUMBER(S) 

12. DISTRIBUTION/AVAILABILITY STATEMENT 
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES 

14. ABSTRACT 
The U.S. Air Force Medical Service presented the fifth annual Air Force Medical Research Symposium coordinated by the Air Force Medical Support Agency’s Research and Development Division (AFMSA/SGRS). The symposium was held 24-26 August 2010 at the Doubletree Hotel Washington DC ? Crystal City, Arlington, VA. The symposium featured two half-days of plenary sessions, one and a half days of scientific presentations, and a poster session. It was organized into four tracks to include: Operational & Medical, Enroute Care, Force Health Protection, and Nursing. These proceedings are organized into five volumes to include one that provides a general overview and all presentation and poster abstracts; the other four each address a specific track. Volume I contains a general overview of the entire 2010 Air Force Medical Research Symposium and includes abstracts of all the oral presentations and posters, information and presentations from the opening and closing plenary sessions, symposium agenda, and attendee list.

15. SUBJECT TERMS 

16. SECURITY CLASSIFICATION OF: 

a. REPORT  
unclassified  

b. ABSTRACT  
unclassified  

c. THIS PAGE  
unclassified

17. LIMITATION OF ABSTRACT  
Same as Report (SAR)

18. NUMBER OF PAGES  
133

19a. NAME OF RESPONSIBLE PERSON 

Standard Form 298 (Rev. 8-98)  
Prescribed by ANSI Std Z39-18
Proceedings of the 2010 AFMS Medical Research Symposium

Symposium Planners

FROM:
Office of the Air Force Surgeon General
Directorate for Modernization
SG9S: Research and Development

Col Donald White ..................... Director, Research and Development/SG9S
Col Michelle Bryce .................... Thrust Area Manager (TAM), Operational Medicine
Lt Col Tim Wiley ....................... Clinical Investigation Program Manager
Maj Colby Adams ..................... TAM, Force Health Protection
Maj Cliff Otte ......................... TAM, Expeditionary Medicine
Maj Cadina Powell .................... Congressional Program Manager
Mr. Glenn Conway .................... En-Route Care
Mr. Nehal Desai ...................... Force Health Protection
Mr. Calvin Griner .................... Acting TAM, En-Route Care
Dr. Welford C. Roberts ............. Force Health Protection
Ms. Nereyda Sevilla ................. Acting TAM, Human Performance, and Clinical Investigation/Research Program
Ms. Jen Snyder ...................... Executive Assistant, Portfolio Management
Ms. Cynthia Grant.................... Conference Planner
# Table of Contents

<table>
<thead>
<tr>
<th>Subject</th>
<th>Page Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symposium Planners</td>
<td>ii</td>
</tr>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Welcome &amp; Overview</td>
<td>2</td>
</tr>
<tr>
<td>Opening Plenary Session</td>
<td>2</td>
</tr>
<tr>
<td>Presentation Abstracts</td>
<td>3</td>
</tr>
<tr>
<td>Operational and Medical Track</td>
<td>4</td>
</tr>
<tr>
<td>Enroute Care Track</td>
<td>11</td>
</tr>
<tr>
<td>Force Health Protection Track</td>
<td>18</td>
</tr>
<tr>
<td>Nursing Track</td>
<td>25</td>
</tr>
<tr>
<td>Closing Plenary Session</td>
<td>27</td>
</tr>
<tr>
<td>Poster Abstracts</td>
<td>28</td>
</tr>
<tr>
<td>Appendices</td>
<td>46</td>
</tr>
<tr>
<td>Appendix A. AFMS Medical Research Symposium Agenda</td>
<td>47</td>
</tr>
<tr>
<td>Appendix B. List of Attendees</td>
<td>54</td>
</tr>
<tr>
<td>Appendix C. Continuing Education</td>
<td>70</td>
</tr>
<tr>
<td>Appendix D. Keeping Our Promise Through Medical Research and Development</td>
<td>71</td>
</tr>
<tr>
<td>Appendix E. Armed Forces Institute of Regenerative Medicine (AFIRM)</td>
<td>77</td>
</tr>
<tr>
<td>Appendix F. Defense Technical Information Center (DTIC)</td>
<td>85</td>
</tr>
<tr>
<td>Appendix G. Blood Pharming</td>
<td>91</td>
</tr>
<tr>
<td>Appendix H. Mild Traumatic Brain Injury and Sleep</td>
<td>98</td>
</tr>
<tr>
<td>Appendix I. Defense Centers of Excellence (DCoE)</td>
<td>109</td>
</tr>
<tr>
<td>Appendix J. Simulation Training Research-Trauma Man</td>
<td>115</td>
</tr>
<tr>
<td>Appendix K. Joint Technical Coordinating Group (JTCG) Updates</td>
<td>121</td>
</tr>
</tbody>
</table>
Introduction

The U.S. Air Force Medical Service presented the fifth annual Air Force Medical Research Symposium coordinated by the Air Force Medical Support Agency’s Research and Development Division (AFMSA/SGRS). The symposium was held on 24-26 August 2010 in the Washington D.C. area at the Doubletree Hotel Washington DC – Crystal City in Arlington, VA. The symposium featured two half-days of plenary sessions, one and a half days of scientific presentations, and a poster session.

The symposium was organized into several tracks to include Operational & Medical, En-route Care, Force Health Protection, and Nursing, as follows:

- The Operational & Medical Track focused on patient care and treatment in garrison, expeditionary care during contingency operations, and enhancing performance of airman in challenging environments.
- The Enroute Care Track addressed science and technology targeted at the continuum of care during transport from point of injury to definitive care to include medivac, aeromedical evacuation, critical care air transport, patient staging, and patient safety.
- The Force Health Protection Track focused on prevention of injury and illness and the early recognition or detection of emerging threats for in-garrison or deployed operations. Topics of interest include research in bio-surveillance, infectious disease, emerging threats (pandemic response), protective countermeasures, disaster response/consequence management, toxicology/health risks (e.g., particulates nanomaterials, radiation, etc.), monitoring disease trends, other areas of preventive medicine, public and environmental health relevant to the military workforce.
- The Nursing Track focused specifically on evidence based practice.

These proceedings are organized into five volumes, as follows:

- Volume 1. This volume is a general overview of the entire 2010 Air Force Medical Research Symposium and includes abstracts of all the oral presentations and posters. First presented is the symposium’s opening plenary session, followed by the abstracts from the four technical tracks, and then the closing plenary session. The abstracts associated with the poster session are in the last section of these proceedings. The agenda for the overall symposium is in Appendix A, attendees are listed in Appendix B, and continuing education information is in Appendix C of this volume. Appendices D-L are copies of presentation slides from the plenary sessions.
- Volume 2. This volume contains abstracts and presentation slides for the Operational & Medical Track.
- Volume 3. This volume contains abstracts and presentation slides for the Enroute Care Track.
- Volume 4. This volume contains abstracts and presentation slides for the Force Health Protection Track.
- Volume 5. This volume contains abstracts and presentation slides for the Nursing Track.
Welcome & Overview

Overview and Opening Remarks
Nereyda Sevilla
SGRS

SGRS Welcome
Col Don White
Director, Research and Development

SGR Welcome
Brig Gen James Carroll
Commander, Air Force Medical Support Agency

Opening Plenary Session

*Presentation slides are in appendices as noted.

Keeping Our Promise Through Medical Research and Development
Dr. Peach Taylor
Deputy Assistant Secretary of Defense for Force Health Protection & Readiness
(See Appendix D)

Defense Medical Research and Development Program (DMRDP)
COL Dallas Hack
Director, US Army Combat Casualty Care Research Program

Armed Forces Institute of Regenerative Medicine (AFIRM)
LTC Brian Moore
Program Manager
(See Appendix E)

Defense Technical Information Center (DTIC)
Ms. Shari Pitts
DTIC
(See Appendix F)
Information Collection Division
Operational and Medical Track

Tuesday, 24 August 2010

1300 Attenuation of Altitude De-acclimatization/Neocytolysis with Exercise Intervention
Human Performance Laboratory- United States Air Force Academy

INTRODUCTION: Astronauts and high-altitude (>4000m) residents experience neocytolysis—a rapid reduction in total hemoglobin mass (THM)—upon return to sea level (SL; <300m). Whether exercise intervention can mitigate this loss is unknown. PURPOSE: This study examined changes in THM among moderate altitude (MA; ~2210m) residents who completed various ‘exercise prescriptions’ during a three-week winter break spent at SL. Based on previous studies, we expected all subject’s THM to decrease significantly; however, we hypothesized cadets performing high-intensity exercise would minimize THM loss. METHODS: Fifty three cadet subjects (39 male, 14 female) age 20.5 ± 1.5 years participated in the study. Each subject was scheduled for THM assessment using the optimized CO re-breathing protocol twice the month prior to departing for SL, and twice upon their first week returning to MA. Subjects were classified into one of three groups: ‘control’ (moderate exercise), ‘interval’ (high intensity), or ‘endurance’ (high volume). Statistical analysis consisted of 1-tailed independent sample and paired T-tests with p < 0.05. RESULTS: All subjects had a significant (p < 0.001) loss in THM over winter break, losing 3.7% (-28.3 ± 29.3g) on average. The ‘interval’ group lost only 2.9% (-23.0 ± 33.2g), while the ‘control’ group lost 4.9% (-37.3 ± 27.0g), which neared statistical significance (p = 0.061). The ‘endurance’ group lost 3.3% (-25.1 ± 26.7g; p < .1, compared to the ‘control’ group). CONCLUSIONS: All subjects’ THM significantly decreased despite exercise intervention while at SL. However, exercise intervention attenuated THM loss, and the interval group’s decrease neared statistical significance.

1330 Impact of Alternating Days of Intermittent Hypoxic Exposure (IHE) on Physical and Cognitive Performance
United States Air Force Academy- Alabama Department of Public Health (ADPH)
Michael F. Zupan, Monica S. Herrera, Lynette M. Lennemann, Julia N. McGregor and Thomas B. Walker

BACKGROUND: Unacclimatized military personnel rapidly deployed to moderate altitude (MA) (2750-3660m) environments are subject to physical and cognitive performance impairments. PURPOSE: The primary purpose of this study was to determine if alternating days of intermittent normobaric hypoxic exposures (IHE) for unacclimatized, sea-level residents works as a training strategy to minimize physical and cognitive impairments in battlefield airmen during MA deployments. METHODS: We conducted a crossover style, randomized study to assess the efficacy of IHE on performance decrements. Baseline physical and cognitive tests were conducted at sea level (SL), normobaric hypoxic (NH), and hypobaric hypoxic (HH) environments. Subjects were randomly assigned to either five consecutive (C-IHE) or five alternating (A-IHE) days of IHE. All tests were repeated post-IHE exposure. Following a four-week washout interval, all subjects repeated the process again under the opposite IHE exposure schedule. Intra-subject differences between training regimens (C-IHE vs. A-IHE) and the three environments (SL vs. NH vs. HH) were analyzed. RESULTS: Seven well-conditioned (VO2 max = 57 mL-1.Kg-1.min) male subjects (30.4 ± 8.7 yrs) completed the study. Significant physiological differences (p<0.05) between SL and NH or HH were observed. There were significant differences at HH environment for anaerobic endurance distance (p=.01), but not VO2 max (p=.27), max HR (p=.21) between C-IHE and A-IHE training regimens. Analysis of cognitive and acute mountain sickness data is ongoing and will be reported at the Symposium. CONCLUSIONS: C-IHE may result in greater altitude adaptations than A-IHE allowing battlefield airmen to better prepare themselves for MA deployments.
This study was funded with a research grant provided by the Air Force Surgeon General Office and the Air Force Research Laboratory.

1400 Altitude-related Differences in Running Economy among Sea Level Residents during 46 Weeks at Moderate Altitude

United States Air Force Academy- Alabama Department of Public Health (ADPH) Human Performance Laboratory, United States Air Force Academy, 2169 Field House Drive/Ste. 111, USAF Academy, CO 80840

Jeffrey L. Nelson, James A. LaChapelle, Elizabeth C. Grossmann, Michael F. Zupan, Brandon K. Doan, Michael D. Brothers

INTRODUCTION: Although improvement in sea level (SL) running economy (RE) following short-term altitude exposure has been demonstrated, changes in RE among SL residents following chronic moderate altitude (MA; 2210m) residence have not been examined. PURPOSE: To assess differences in RE between SL and MA subjects during 46 wks of chronic residence at the U.S. Air Force Academy. It was hypothesized that SL subjects would have significantly worse RE initially, but RE would improve following MA acclimatization.

METHODS: 55 male subjects (18.7 +/- 0.7 yrs) from SL (n = 44) and MA (n = 11) had their RE assessed (6-9 mph) on 5 separate occasions over 46 wks. Correlations between total hemoglobin mass (THM) and RE data were assessed. Subjects were supplemented with either iron or placebo.

RESULTS: SL subjects had significantly (p < 0.05) worse RE compared to their MA peers after 8-10 wks at MA at all velocities examined (46.0 +/- 4.3 vs. 42.7 +/- 3.4 ml/kg/min; SL vs. MA, respectively). All subjects’ RE changed significantly (p < 0.05) over time. The altitude-related difference became non-significant after +16-18 wks. There was no difference in RE due to iron supplementation. Despite changes in RE and THM among SL subjects residing at MA, there were no significant correlations between THM and RE. CONCLUSIONS: Significant altitude-related differences existed in RE and THM for 15+ wks at USAFA, but did not correlate significantly. These data suggest chronic MA acclimatization results in changes to both RE and THM, but unique adaptations may underlie each.

This research funded by a HQ AF/SGRS grant.

1445 AFRRI’s history, mission, and current research and education programs

Armed Forces Radiobiology Research Institute (AFRRI), Bethesda, MD

Maj Michael Dempsey

The concern of a major radiological or nuclear attack has been reduced since the end of cold war. However, the threat of nuclear or radiological terrorism has become a subject of increased interest, especially after the events of September 11, 2001. The Armed Forces Radiobiology Research Institute (AFRRI) is the only DoD facility dedicated to research on the assessment and treatment of radiation injuries. The research focus areas include biodosimetry; countermeasure development; elucidation of molecular basis of radiation injury, alone or with wound, burn, and/or infection polytraumas, as well as effective treatments; potential uses of radiation to defeat biowarfare and bioterrorism agents; and methods for treatment of internal contamination of military-relevant heavy metals. This presentation will provide an overview of AFRRI’s history, mission, and current research and education programs.

1515 A Model Graduate Medical Education Military Unique Training Program

59th Medical Wing (MDW)/59 MCCS, Lackland AFB, TX

LtCol Vinod Gidvani-Diaz

The San Antonio Uniformed Services Health Education Consortium Pediatric Residency ongoing program in Honduras is designed to give military pediatric residents a unique experience in International Health and Stability Operations. The training, which combines didactic learning stateside with hands on experience in Honduras, focuses on health conditions that cause morbidity in post-war/disaster scenarios.

During the two week preparatory phase, residents are exposed to a curriculum that is geared toward understanding goals of Stability Security Transition and Reconstruction Operations (SSTRO), command structure used the military in joint operations, and planning and executing a Humanitarian Civic Assistance mission. Trainees also complete the Military Medical Humanitarian Assistance Course, a 2-day program designed to teach providers from varying backgrounds the unique and practical aspects of pediatric medicine in austere, resource-limited environments.

In the in-country phase of the program, participants conduct a two-week Medical Readiness Training Exercise in rural Honduras. Residents plan all mission aspects including intelligence briefs, creating an operational plan and coordinating it with chief stakeholders, and preparing logistical support. During execution of the mission, trainees learn and demonstrate competence with practical military field skills, gain
A critical strategic partnership was recently established between the CWIP and the AFIP for the establishment and hosting of the CWIP Biospecimen Network program. This joint effort is aimed at wound bioburden analysis, molecular diagnostics and therapeutics using cutting edge instrumentation and techniques. In support of this effort, we have established a “Combat Wound Microbial Culture Collection” and "Antibiotic Resistance Plasmid Library”. These collections will provide significant resource for DOD in conducting research in biosurveillance of combat related infections. This collaborative, multidisciplinary, inter-service program will clearly lead to the much needed improved treatment and fast recovery of our combat wounded soldiers. We will provide an overview of the ongoing efforts in support of an unprecedented initiative in biosurveillance of infectious agents using cutting edge instrumentation and bioinformatics. Our efforts may lead to developing much needed methodologies for differentiation between natural or intentional exposures to current and emerging infectious disease agents.

Recent data in critically ill patients suggest aggressive management of hyperglycemia is not always associated with improved outcomes and may be associated with risks. Implementation of hospital-wide policies and standardized insulin protocols will assist providers in selecting the appropriate insulin regimen while avoiding adverse events. In January 2009, an intravenous insulin infusion protocol with new blood glucose (BG) targets of 100 to 150 mg/dL was implemented in critical care units at Wilford Hall Medical Center. The insulin infusion is titrated according to protocol to obtain and maintain a goal value of 100-150 mg/dL. From January to May 2009 a total of 46 patients were placed on the protocol. Average age was 59 (58.8±17.5) and 58.7% were male. Out of all three units 50% the patients had type 2 diabetes. Percentage of time patients were at target BG goal (100-150 mg/dL) was 52.3±21.1% (52.3±21.1% SICU 49.3±17.3% MICU, 69.6±29.7% CCU). The median duration to achieve goal was 5.7 hours (7.0, 5.4, 1.1, respectively). Hypoglycemia rates (<60 mg/dL) averaged 0.8%, 1.0%, and 0.7% respectively. Length of stay (LOS) was stratified by vital status. Among survivors, the average LOS was five days with the longest LOS in the MICU (6 days) and shortest in the SICU and CCU (4 days). The largest difference according to vital status was observed in the SICU (3 days vs. 7 days). Although this is an initial evaluation of newly implemented target BG ranges, results shown are comparable to those demonstrated previously in the literature and this facility.

*affiliated with the University of Pittsburgh

0830 Management and Treatment of Pediatric Obesity in a Military Outpatient Setting
University of Pittsburgh Medical Center (UPMC)
Jodi Krall, PhD; Acknowledgements: Silva Arslanian*, MD, and Goutham Rao*, MD

The increasing prevalence of obesity in civilian and military dependent populations poses significant challenges in identifying future military recruits with appropriate physical qualifications. In addition, an increasing number of military dependents are diagnosed with risk factors for type 2 diabetes. The military will be affected by the tremendous humanistic and economic...
burden unless prevention and treatment programs that include healthy lifestyle changes are implemented. For this reason, the University of Pittsburgh Medical Center partnered with the Air Force to develop an evidenced-based model for primary prevention of type II diabetes at Wilford Hall Medical Center at Lackland Air Force Base. The San Antonio Military Pediatric Center (SAMPC) Pediatric Wellness Center employs a multidisciplinary team approach to provide family-centered lifestyle intervention, counseling, and goal-setting strategies to implement therapeutic behavioral changes in overweight and obese high-risk children and adolescent patients and their families. The Center is also designed to serve as a hub-site for research studies supporting scientific advancement in the understanding of obesity, type II diabetes, and related conditions as well as for testing innovative treatment approaches. This presentation will be used to review the rationale for and design of the program; describe intervention techniques, which include standardized clinic-based lessons and Web-based interactive educational tools; present preliminary findings; and discuss of future directions.

*affiliated with Children's Hospital of Pittsburgh of UPMC and University of Pittsburgh

0900 Budget Impact Analysis of Bariatric Surgery for Morbid Obesity

University of Washington

Rafael Alfonso

Obesity is reported to increase mortality, morbidity, and costs. Bariatric surgery remains the most effective treatment for long-term weight loss. We developed a payer-based Budget Impact Model (BIM) to assess “Return On Investment (ROI)” for bariatric surgery in obesity compared to non-operative interventions.

The purpose of this BIM is to estimate the financial consequences of adoption of different types of Bariatric surgeries within a specific health care setting given inevitable resource constraints. The BIM can be customized based on the characteristics of the population of interest (i.e. number of lives covered, age, gender, and body mass index) and the alternatives of interventions presented (i.e. Different types of bariatric surgeries and/or different degrees of use of each procedure). Since each bariatric procedure has different costs, and may be associated with different levels of weight loss and complications; the inputs used for the costs, complications, and mortality rates, are derived from a Cost-Effectiveness Model from nationally representative databases and the best estimates from the published literature.

Average annual costs per patients for each procedure are multiplied by the number of eligible subjects receiving the specific procedure. These costs are accumulated over a 10-year period and compared to the cumulative costs of eligible subjects for bariatric surgery who did not receive the procedure. Results are expressed as the increment of total costs per member per year. By examining different scenarios, with different levels of eligibility and mix of surgical procedures, decision makers could estimate accurately the ROI associated with each alternative over time.

0945 Pilot Study of a Diabetes Prevention Program in a Military Community

USAF, Lackland AFB, TX

Lisa Strickland, MD, Joseph Pollard, MPH; Acknowledgements: Donna L. Wolf*, PhD, Hsiang-Yu Chen*, Ms, Linda Siminerio*, RN, PhD

INTRODUCTION: Approximately 57 million Americans ≥ 20 years have pre-diabetes, placing them at risk of developing diabetes (T2D) and cardiovascular disease (CVD). Despite having weight and fitness standards, incidence of T2D in military personnel is similar to the civilian population (1.9 vs. 1.6 cases per 1,000 persons per year). Progression to T2D among those with pre-diabetes is not inevitable. The Diabetes Prevention Program (DPP) demonstrated that a lifestyle intervention lowers the risk for developing T2D.

PURPOSE: Our objective was to determine if a Group Lifestyle Balance (GLB) intervention (based on the DPP), for individuals with metabolic syndrome (MetS), is effective in decreasing risk for T2D and CVD in a military community. Methods: This was a non-randomized pilot study. Participants from Wilford Hall Medical Center (WHMC) were screened for MetS (n = 58) and participated in a 12-week GLB (n=19) that focuses on safe weight loss and physical activity.

RESULTS: Participants lost an average of 11.4 pounds over the 12 week period (p< 0.001). BMI decreased by 2 kg/m2 (p=0.001). Although not statistically significant, there was a clinically important decrease of 10mmHg in systolic blood pressure (p = 0.07). Glucose decreased by 3mg/dl, but was not statistically significant (p =0.06). There was a significant decline in the number of MetS parameters from an average of three to two. Conclusion: Adults in a military community can decrease their BMI through participation in a GLB intervention. Effort to train military health professionals, e.g. nurses, dietitians, on the GLB is underway for program dissemination.

*affiliated with the University of Pittsburgh
1015 Decreased Blood Glucose Levels among Metformin Dependent Diabetics Undergoing Hyperbaric Oxygen Treatment

United States Air Force School of Aerospace Medicine (USAFSAM)/FEER, Brooks AFB, TX

Maj Todd Huhn

BACKGROUND: Previous studies have shown significant decreases in blood glucose levels of insulin-dependent diabetics undergoing hyperbaric oxygen treatment (HBO2). Under normobaric conditions, metformin is not generally associated with hypoglycemia, but there has been little done to look specifically at the effects of metformin on blood glucose levels in diabetics undergoing HBO2. METHODS: This case series study evaluated a cohort (n=16) of metformin dependent diabetic patients to determine whether metformin is associated with decreased blood glucose levels while undergoing HBOT. Data was obtained by chart review of patients from 2002-2009. Sixteen patients were identified who were solely dependent on metformin for glucose control. All patients received pre- and post-treatment blood glucose evaluations as well as clinical evaluations for signs and symptoms of hypoglycemia following HBO2. RESULTS: Pre-HBO2 glucose averaged 175 mg/dL (range 131-329) and post-HBO2 glucose levels averaged 144 mg/dL (range 63-337.5). Mean blood glucose levels demonstrated a statistically significant decrease of 33.1 mg/dL (P<0.005). None of the patients exhibited signs or symptoms of hypoglycemia. CONCLUSION: Statistically significant decrease in blood glucose was identified in diabetic patients receiving HBO2. Although rare, hypoglycemia did occur. Post HBO2 glucose monitoring is recommended in diabetic patients prior to discharge from the hyperbaric facility.

1045 Team Based Approach to Diabetes Care

Wilford Hall Medical Center (WHMC), Medical Wing (MDW), Lackland AFB, TX

Mark True, MD, Nina Watson, RN, CDE, Joseph Pollard, MPH, Acknowledgements: Linda Siminerio*, RN, PhD, Kristine Ruppert*, DrPH

INTRODUCTION: A team approach has repeatedly been shown to improve the quality of care for individuals with diabetes. The Diabetes Center of Excellence (DCOE) at Wilford Hall Medical Center (WHMC) serves as a military regional hub for the provision of quality programs and a specialty clinic with team-based care resources for patients. The DCOE team serves as a referral center for patients with diabetes not meeting clinical targets. RESULTS: Patients were seen at the DCOE between January and December 2009. Results are based upon data collected from patients with an initial A1c >6% and documented follow-up A1c (n=378). These patients showed an average A1c decrease of 0.67% (p=0.001). Patients with an initial A1c >7% (n=323) showed an average decrease of 0.84% (p=0.001); patients with an initial A1c >8% (n=238) showed an average decrease of 1.12% (p=0.001); and patients with an initial A1c >9% (n=134) showed an average A1c decrease of 1.62% (p=0.001). CONCLUSION: These results indicate that a team-based specialty diabetes clinic in a military facility has a positive impact on glycemia. Additional study is needed to evaluate the impact on other metabolic outcomes.

*affiliated with the University of Pittsburgh

1245 The Effect of Special Duty Subpopulations on the Prevalence of Secretive Behaviors in the USAF

United States Air Force School of Aerospace Medicine (USAFSAM)

Col Mary Brueggemeyer

In the USAF, special duty status is defined as FLY, PRP (Personnel Reliability Program) or SCI (Special Compartmented Information) related duties. It is used to designate mission critical populations upon whom the AF Medical Service (AFMS) can apply focused preventive efforts to maintain human performance and insure mission success. These special duty subpopulations differ in work culture and job stress that may influence the prevalence of secretive behaviors such as alcohol abuse, suicidality and partner/child abuse. Knowledge about the prevalence of secretive behaviors within these special duty subpopulations could help focus prevention efforts. The USAF NORTHSTAR Project uses an anonymous community assessment (CA) survey to measure secretive behaviors by base and special duty status, but does not stratify by special duty subpopulation. Using official USAF manpower allocations, bases with predominant special duty subpopulations were grouped together. The 2008 CA survey was analyzed using the special duty subpopulation groups. Results showed that aircrew bases (AC) were more likely to report alcohol problems than SCI bases (OR 1.64, CI 1.25-2.15, p= 0.002); PRP bases were more likely to report suicidal thoughts than AC bases (OR 2.33, CI 1.29-4.19, p=0.004) and SCI bases were more likely to report spouse emotional abuse than AC bases (OR 1.77, CI 1.19-2.65), p=0.004) or PRP bases (OR 1.34, CI 1.01-1.79, p=0.04). Special duty subpopulations are not homogenous. Knowledge of the risk and protective factors within these communities will improve prevention of secretive behaviors and reduce mission impact. Future CA surveys should stratify by special duty subpopulation.
1315 The Association between Mental Health and Cigarette Smoking in Active Duty Military Members
United States Air Force School of Aerospace Medicine (USAFSAM)/FEER RAM-X
Maj/Dr. Erich Schroeder

Despite an overall decrease in smoking in the armed forces, the prevalence of smoking in the military remains at approximately thirty-three percent. Previous research has shown an association between mental health status and cigarette smoking. This cross-sectional prevalence study examined four specific mental health predictors and the outcome variable any smoking. The four specific mental health predictors include “needed further depression evaluation,” “received mental health counseling,” “perceived need for mental health counseling,” and “depression or anxiety medical prescription.” The outcome variable any smoking is defined as smoking one or more cigarettes in the past 30 days. The population included active duty military members serving in the United States Army, Air Force, Navy, and Marine Corps. The data was collected during the 2005 Department of Defense Survey of Health Related Behaviors Among Active Duty Military Personnel, a component of the Defense Lifestyle Assessment Program. The sample size included 13,603 subjects. This study consisted of descriptive statistics, univariate analysis, and multivariate logistic regression analysis of the four mental health predictors and the any smoking outcome variable. Univariate analysis and multivariate adjustment showed the data to be reliable. These analyses also showed an association between the four mental health predictors and any smoking, but not necessarily that mental health predicted smoking. More research and analysis is required to better determine the association of mental health with smoking in this population. This research could help guide public health officials in the development of smoking prevention and cessation programs not only for the military population, but also for the population at large.

1345 The Association between Mental Health and Hypertension in the 2005 DoD Population Survey
United States Air Force School of Aerospace Medicine (USAFSAM)
Lt Col/Dr. Scott Zaleski

Major objectives within Healthy People 2010 include improving hypertension and mental health management of the American population. Cases of either diagnosis may be incompatible with military service even with optimum treatment. The Department of Defense regularly conducts a survey of health-related behaviors among active duty military personnel. The 2005 DoD Survey was conducted to obtain information regarding health and behavioral readiness among active duty military personnel to assess progress toward selected Healthy People 2010 objectives.

This study is a cross-sectional prevalence design looking at the association of hypertension treatment with mental health issues (whether there is a significant association between the self-reported occurrence of hypertension and the self-reported occurrence of mental health issues in the 2005 DoD Survey). In addition to these variables, this survey examined the contribution of various sociodemographic, occupational, and behavioral covariates. An analysis of the demographic composition of the study variables was followed by logistic analysis, comparing outcome variables with each of the independent variables. Following univariate regression analysis, multivariate regression was performed with adjustment (for those variables with an unadjusted alpha level less than or equal to 0.25).

All the mental health related indicators were associated with hypertension treatment. The same relationship was maintained after multivariate adjustment. The covariates remaining as significant (p < 0.05) in the final model included gender, age, race/ethnicity, and obesity. Optimum health of the individual can be facilitated through discovery of treatable cases, to minimize disruptions of military missions, and even allow for continued military service.

1430 Psychosocial Stress of RPA Operators
United States Air Force School of Aerospace Medicine (USAFSAM)
Aeromedical Psychologist Wayne Chappelle

USAF Remotely Piloted Aircraft (RPA) operators are placed in the unique position of engaging in around the clock "tip-of-the-spear" surveillance, reconnaissance, and precision strike aerial operations in theaters of conflict while simultaneously living at home and juggling the demands of their domestic life. This unique aspect of RPA operations has raised questions about the impact on the health of RPA operators. Research has found RPA operators to experience greater levels of fatigue in comparison to airborne aircrew (i.e., AWACS, JSTARS). Yet, concerns regarding negative changes in psychological health effecting performance and readiness are abundant. However, no empirical studies have been conducted to officially screen for PTSD, clinical levels of psychological distress, and other changes in psychological health. To fill the current gap, this study had RPA operators (pilots, sensor operators, and mission intelligence coordinators) from AFSOC, ACC, ANG, and Reserve MQ-1 Predator, MQ-9 Reaper squadrons complete standardized, commercial, questionnaires assessing the psychological health and levels of clinical stress diagnostic of a mental health...
disorder (including PTSD). Comparisons were made between active duty, and national guard/reserve units. This study provides key information on the prevalence of symptoms among such RPA operators and informs flight medicine physicians and operational leadership the extent of mental health services needed. This study provides a measure to gauge the extent of symptoms to best ensure that adequate resources are available to sustain the readiness of these airmen so they may continue to fly, fight, and win.

1500 Multivariate Analysis of MAB-II and MicroCog Neuropsychological Screening in Rated USAF Pilots
United States Air Force School of Aerospace Medicine (USAFSAM)
Maj/Dr. Bret Heerema

BACKGROUND: Intelligence testing and neuropsychological screenings have multiple uses in the selection and assessment of United States Air Force (USAF) pilots and pilot applicants. These tests are a critical part of USAF medical flight screening and aeromedical waiver procedures after neurological insult for aircrew. The purpose of this study is to assess the factorial structure regarding a measure of intelligence testing given to USAF pilot training applicants (manned as well as unmanned) during medical flight screening. Is the factorial structure of intelligence testing difference for such a specialized occupational group different from the general population? METHODS: Principal components analysis was conducted on the intelligence test scores from the Multidimensional Aptitude Battery-Second Edition (MAB-II) administered to 10,612 USAF pilot applicants selected for training. Subtest and measurement model correlations were also estimated. RESULTS: Neuropsychological screening consisting of the MAB-II suggests there are three correlated indices unique to the rated USAF pilot population in contrast to the two-factor measurement model of the general population. In addition to verbal intelligence quotient (IQ) and performance IQ factors, a visual processing speed IQ comprised of the arithmetic, digital symbol, and spatial score subtests is present in this population. Confirmatory factor analysis using this model of the MAB-II showed positive correlations between the factors and between specific subtests. CONCLUSIONS: There are significant differences between the general population and rated USAF pilots’ intelligence test scores. The relationship of these scores must be well understood to effectively evaluate how other aptitudes are affected with changes in any particular subtest. Neuropsychologists should be sensitive to such differences and use population specific normative data in evaluating the cognitive disposition of rated USAF pilots. Further studies are needed to determine the role of these factors in performance in the pilot population leading to more accurate predictive cognitive aptitudes.

1530 Risk of Prostate Cancer in USAF Aviators
United States Air Force School of Aerospace Medicine (USAFSAM)
Col Marc Goldhagen

BACKGROUND: There have been several studies indicating elevated incidence of prostate cancers in aviators both in the civilian and military sectors. Some studies show an increased risk for cancer in aviators and some do not. These studies compare aviators with the general population and these two cohorts can differ substantially in terms of socioeconomics, health surveillance, and environmental exposures. We were interested in conducting a controlled study in which prostate cancer incidence was compared in aviators using a reference group which is more similar to the aviators. METHODS: This retrospective analysis compared incidence of prostate cancer between USAF aviation officers and non-aviation officers using the Automated Cancer Tumor Registry of the Department of Defense linked to personnel records from the USAF Personnel Center. RESULTS: Crude incidence ratios were compared to SEER data of the overall US population showed slightly lower incidence in USAF personnel. Kaplan-Mier survival curves showed no difference between the USAF aviators and non-aviators. Cox Proportional Hazards model also confirmed no difference between the two groups after controlling for age and race. DISCUSSION: This study showed no difference in prostate cancer incidence between USAF aviators and non-aviators. While the study included a relatively large sample size, limitations of the study include a young population group, in which low incidence would be expected.
Enroute Care Track

Tuesday, 24 August 2010

1300 Optimal User Interface for Remote Enroute Care Patient Monitoring
CSTARS- Cincinnati
Richard D. Bucholz, MD

Introduction: The U.S. Army Medical Research and Materiel Command recommends operating rooms are developed that “design and test the optimal User Interface (UI) for surgeons, anesthesiologists, and nurses to input and access clinical data. The optimal UI will support multi-mode access, where clinicians are able to use mobile devices, internet browser access to intranets, and adequate remote access through secured internet connections.” The Saint Louis University (SLU) Advanced Neurosurgical Innovation Center provides test-bed capacity to translate technology from bench to simulated test-bed, to the field. Methods: Multimodal technology developed at SLU (SLU, U.S. Pat No. 6,928,490) will provide a networking infrastructure to permit variable-bandwidth testing of medical device telemedicine in collaboration with existing USAF C-STARS simulation laboratory facilities at SLU.

Results: (1) Create a shielded space manifested by a firewall-protected wired and wireless network, (2) Provide life support networked and controlled by the system, (3) Develop display devices to provide visualization for the surgeon as well as any other required participants to enable experts to remotely participate in a given intervention, (4) Enhance plasticity by removing cumbersome set-up tasks and allowing unprecedented connectivity between devices. (5) Allow rigorous documentation and archiving of all information generated within a continuum of care. Conclusion: This proposal will develop and test technology to integrate medical communication within a shielded environment, allow remote projection of medical and surgical expertise and control over variable bandwidth networks with secure encrypted remote command, and allow monitoring on route from forward locations to the final definitive care facility.

1330 Vascular Injury Rates from the Wars in Iraq and Afghanistan
59th Medical Wing (MDW)/SSSOGV
Todd E. Rasmussen MD, Joseph M. White MD, W. Darrin Clouse MD, Gabriel E. Burkhardt MD, Adam Stannard MRCS, Brian J. Eastridge MD, Lorne H. Blackbourne MD

The Institute of Surgical Research, Fort Sam Houston, Texas and the Uniformed Services University of the Health Sciences, Bethesda, Maryland

OBJECTIVE: The rate of vascular injury in WWII, Korea and Vietnam was 2-3%; however, not since Vietnam has the epidemiology of this injury pattern in war been possible. This study objective is to report the burden of vascular injury over 7 years of recent combat. METHODS: The Joint Theater Trauma Registry was queried (2002-2009) for vascular injury in US Troops and groups defined. Group 1 (specific): Troops having sustained specific vascular injury and Group 2 (operative): Troops having undergone a designated operation for vascular injury. RESULTS: Group 1 included 1,597 Troops injured in Iraq (OIF) (n=1,417) and Afghanistan (OEF) (n=180). Mechanism included explosive (75%), gunshot (24%) and other (1%) with explosive more common in OIF than OEF (p<0.05). During this period, 13,076 battle related injuries occurred resulting in a specific rate of 12% (1,597/13,076) which was higher in OIF than OEF (13% vs. 9% respectively; p<0.05). Of Group 1, 60% (n=940) sustained injury to major or proximal vessels and 40% (n=630) to minor or distal vessels: categorized as arterial 64%, venous 16% or combined 20%. Group 2 comprised 1,212 Troops revealing an operative injury rate of 9% (1,212/13,076) and included ligation (n=660; 54%) or repair (n=552; 46%). The “died of wounds” rate was 6.2% in OIF and 7.2% in OEF (p =0.64). CONCLUSION: The rate of vascular injury recorded in modern combat is 5 times previously reported. Differences in vascular injury burden related to theater of war, mechanism of injury and combat operational tempo can be discerned and anticipated.
1400 Direct Vascular Control Results in Less Physiologic Derangements than Aortic Crossclamping in a Porcine Model
Brooke Army Medical Center (BAMC) - Working with 59 Medical Wing (MDW)/SSSOGV
Capt Nick Markov

OBJECTIVE: Establishing vascular control during resuscitation in patients with end stage, non-compressible extra-thoracic torso hemorrhage remains debated. Currently, guidelines recommend emergency department thoracotomy (EDT) with aortic clamping although trans-abdominal aortic control and direct vascular control of the injury are potential alternatives. The objective of this study is to introduce an animal model of extra-thoracic torso hemorrhage and to compare the effectiveness of various methods of initial open vascular control.

STUDY DESIGN: Animals (Sus Scrofa) (mean weight=80.9 kg) were randomized into 3 groups all of which had class III shock established via hemorrhage from an iliac artery injury prior to exploration with temporary vascular shunting. Group 1: EDT with thoracic aortic clamping (N=6), Group 2: intra-abdominal supra-ceeliac aortic clamping (SCC; N=6), and Group 3: direct vascular control (DVC) of bleeding site without aortic clamping (N=6). All groups were subsequently resuscitated and monitored for 6 hours with repeated measures of central perfusion, cerebral perfusion, and end organ function at standardized time points.

RESULTS: There was no difference in mortality among the groups and no TVS failures. Central aortic pressure, carotid flow and trans-cranial brain oximetry all demonstrated increases in Groups 1 and 2 after application of the aortic clamp relative to Group 3 (p<0.05). During resuscitation, serum lactate levels were higher in Group 1 compared to Groups 2 and 3 (6.85 vs. 3.08 and 2.15, respectively; p<0.05) and serum pH in Group 1 reflected greater acidosis than Groups 2 and 3 (7.24 vs. 7.36 and 7.39, respectively; p<0.05). Groups 1 and 2 required significantly more intravenous fluid than Group 3 (2,166ml and 1,833ml, vs. 500ml respectively; p<0.05) and significantly more vasopressors were used in Groups 1 and 2 compared to Group 3 (52.1mcg and 43.5mcg vs. 10.3mcg, respectively; p<0.05). CONCLUSION: This study reports a novel model of non-compressible extra-thoracic torso hemorrhage comparing the effectiveness of EDT to SCC and DVC. Although EDT and SCC increased central and cerebral perfusion, DVC resulted in less physiologic derangement. Clinical studies evaluating DVC are warranted and require further investigation.

1445 Hemorrhagic Shock Worsens Neuromuscular Recovery in a Porcine Survival Model of Ischemia/Reperfusion Injury
59th Medical Wing (MDW)/SSSOGV
Capt Heather Hancock MD, Lt Cdr Adam Stannard MRCS, Jerry Spencer RVT, Capt Gabriel Burkhardt MD, LTC Todd Rasmussen MD: San Antonio Military Medicine Consortium, University of Texas Health Science Center at San Antonio, and the Uniformed Services University of the Health Sciences Bethesda, MD

BACKGROUND: Current pre-hospital damage control strategies have increased survival to surgical care, resulting in an increased burden of severely injured salvaged limbs and emphasis on the functional outcomes of salvaged limbs. The objective of this study is to characterize the additive effect of hemorrhagic shock in a novel porcine survival model of functional limb outcomes.

METHODS: Groups of 6 animals were randomized to iliac artery repair after progressive times of ischemia. 35% total blood volume was removed at a controlled rate creating Class 3 shock. An earlier arm used the same groups without hemorrhage and was used for comparison. Animals were monitored for 14 days to serially collect markers of functional recovery.

RESULTS: Immediate Iliac repair and 1 hour ischemia animals had full functional recovery by the end of the observation period with minimal histologic evidence of remaining muscle and nerve damage, equivalent to controls without hemorrhage. Following 3 hours of ischemia, functional recovery was delayed and impaired, with moderate to severe degeneration of nerves and muscle noted on histology. Animals undergoing 6 hours of ischemia with the addition of hemorrhage had minimal EMG response and suffered severe systemic inflammation. Histological outcomes demonstrated nearly complete muscle and nerve degeneration. Significant mortality differences were noted when comparing delayed reperfusion groups (3, 6, ligation) with early repair.

CONCLUSION: Results suggest a detrimental impact on the ischemic threshold already defined in a non-hemorrhagic model. It is likely that this model more accurately represents the critically ill combat
casualty and as such will more reliably inform clinical practice.

1515 Quality of limb salvage following wartime extremity vascular injury: results of a novel patient-based outcomes study
UK Research Fellow Working with 59th Medical Wing (MDW)/SSSOGV
Adam Stannard, Gabe Burkhardt, Barbara Keltz, Chantel Porras, Rebecca Ivatury, Shaun Gifford, Todd Rasmussen, 59th Clinical Research Training Division, Wilford Hall Medical Center, 2200 Bergquist Drive, Bldg 4430, Lackland AFB, TX 78236-5300

BACKGROUND: As efforts are increasingly directed beyond statistical, to quality limb salvage, following extremity vascular injury, a patient-based outcomes measure is needed. The objective of this study is to describe a novel questionnaire, designed to assess quality of limb (QOL) in a cohort of combat wounded with limb threatening injuries.

METHODS: Clinical records from the Joint Trauma Theatre System (JTTS) were reviewed for a cohort with extremity vascular injuries between 2002 and 2009. A 21-point questionnaire addressing limb outcome (limb status, pain, functional impairment, satisfaction with current limb) was completed. Patient responses were stratified on a 30-point scale with 0 representing the poorest limb quality. RESULTS: Contact was made with 104/256 (41%) of patients and survey responses for QOL questionnaire from 45 (45%). Eighty-seven percent (39/45) of respondents had lower limb injuries. Nine patients with lower extremity injury (23%) had an amputation and all could mobilize with a device. Lower limb salvage was 76% at 28 months, although 91% reported the extremity did not work normally (77% specifying pain with ambulation). Ninety-one percent report function adequate to enable walking; 53% required daily analgesia for their extremity injury and 32% report they would be better off having had an amputation. Six respondents had upper extremity injuries with no amputations, 100% reported neurologic disability; 1 respondent would have preferred amputation. Overall 48% of the cohorts were separated with disability benefits and 52% remain active duty with a profile.

CONCLUSION: Results from this study demonstrate that patient-based outcomes following extremity vascular injury are limited by secondary amputation, pain and neurologic dysfunction. A novel QOL questionnaire aimed to better characterize functional limb salvage may allow correlation between in-theater strategies and long-term function.

1545 Traveling Fellowship to the United Kingdom as an adjunct to general surgical research and training
59th Medical Wing (MDW)
Lt Cdr Adam Stannard

Military medical missions spanning two mature theaters of conflict require flexible deployment of personnel and resources. International collaboration with allies operating in established facilities in Iraq and Afghanistan generates synergy in patient management, resource utilization, and research development. The impact of these relationships on the education of future physicians and surgeons has not previously been described. The objective of this traveling fellowship is to describe the utility of a brief structured orientation to military medicine and research within the United Kingdom.

Between 12 April and 14 May 2010, as a senior general surgical trainee, I participated in an exchange with the United Kingdom under the mentorship of several senior UK military consultants. In addition to presenting our group’s research at two international meetings, I was invited to participate in the Military Operational Surgery Training (MOST) course. I completed a structured observership at the Royal London Hospital which included exposure to physician driven pre-hospital health care delivery, and operative management of trauma at a level I facility. Injured UK troops recovering at the leading military rehabilitation center in the UK (Headley Court) were interviewed, as were physicians involved in their care to describe functional limb salvage using patient based outcomes measures.

A brief structured exchange within the UK military medical system serves as a productive and meaningful adjunct to my military medical education. Research collaboration with respect to quality of limb outcomes may enable a more comprehensive assessment of the impact of surgical interventions following severe extremity injuries.
**Wednesday, 25 August 2010**

0800 Enhancement in Communication of Performance Improvement Events within a Global Military Trauma System

Landstuhl Regional Medical Center

Kathleen Martin

LRMC is the first military hospital outside the combat zones of Iraq (OIF) and Afghanistan (OEF) and concurrently identifies performance improvement (PI) events/complications (E/C) related to downrange, enroute, and interfacility care. E/C identified in transit between OIF/OEF-LRMC-USA for evacuees accompanied by Critical Care Air Transport Teams (CCATT) are referred to the CCATT Pilot Unit. Aeromedical (AE) E/C are referred to the Air Force AE system PI Director, enhancing communication between ground and flight providers. Urgent issues are communicated verbally and weekly aggregate reports are sent to Joint Theater Trauma System (JTTS) downrange, CCATT and AE liaisons. In 2008, 1230 patients arrive to LRMC; 313 via CCATT and 724 via AE. PI E/C were captured concurrently and entered in the trauma registry by the Trauma Coordinators. There were 148 (12%) E/C identified and referred to JTTS; 28 (5%) to CCATT; 15 (<1%) to AE. In 2009, 1191 patients arrive to LRMC; 299 via CCATT and 813 via AE. There were 337 (28%) E/C identified and referred to the JTTS; 34 (7%) to CCATT; 11 (<1%) to AE. Communication of E/C occurred daily via secure DSN phone lines, encrypted email and video-conferencing. Communication of PI E/C is a challenge due to varied provider demographics, multiservice/national providers, distance across 3 continents, and in the complexity of effective PI. LRMC is the epicenter for bidirectional communication and utilizes technology, trauma PI/registry taxonomy in all interfaces despite distances and diversity, to leverage enhancements. This is an ideal arena to employ a true inclusive trauma system.

0830 Local Hemostatic Agents in a Survival Model of a Lethal Porcine Liver Injury

86th MDS

Maj/Dr. Bradley Putty

Rapid control of bleeding presents a major challenge in the severely injured trauma patient who may present with hypothermia and coagulopathy. Uncontrolled bleeding is the leading cause of combat-related death. The liver is the most commonly injured solid organ, and high grade injuries are difficult to treat. When the bleeding is resistant to standard techniques of control, the surgeon may be aided by the use of advanced topical hemostatic agents. The long term efficacy and safety of using such materials on the liver is unknown.

A survival model of a lethal liver injury in swine was employed to test commercially available advanced hemostatic agents against standard gauze dressing to determine if their use results in a durable decrease in blood loss and mortality. Following induction of hypothermia and a controlled 35% hemorrhage, the animals received a standardized grade IV liver injury. They were randomized to receive packing with plain gauze either alone or with a hemostatic agent (Celox(tm), Celox(tm) Gauze, or QuikClot® COMBAT GAUZE(tm)-the only topical hemostatic currently approved in-theater), with blood loss measured after 15 minutes and 2 days at repeat operation. Observation continued for two weeks before sacrifice with histologic evaluation for delayed effects on the liver and other major organs.

Of the agents tested, Celox(tm) and Celox(tm) Gauze were associated with the greatest 48 hour and 2 week survival, while Combat Gauze(tm) was associated with the highest mortality at 48 hours and 2 days. Celox(tm) appears to be associated with adhesion formation.

0900 Affect of Altitude on Extremity Compartment Syndrome (ECS)

United States Air Force School of Aerospace Medicine (USAFSAM)/FEEH

Dr. John Kalns

INTRODUCTION: ECS is believed to be exacerbated by hypobaric conditions during AE evacuation but scientific evidence supporting this claim does not exist. METHODS: ECS was initiated in the pig by placement of a balloon
catheter between the tibia and the tibialis anterior muscle of the hind limb. Inter-Compartmental Pressure (ICP) greater than Mean Arterial Pressure was maintained for 5 or 6 hours and then reduced and pigs monitored for 8 hours. In some cases pigs were exposed to hypobaric conditions equivalent to 7,000 feet elevation after injury. RESULTS: After injury ICP's increased for 2 hours and then stabilized at an elevated value associated with ECS. Five hour injury (n=10) produced ICP's that meet compartment syndrome criteria, MAP-ICP< 45 mm-Hg, 30% of the time whereas 6h injury (n=10) produced ECS criteria 100% of the time. This finding suggests that there is a critical threshold for ECS. Histological assessment of muscle demonstrated edema, necrosis and extensive neutrophilic infiltrate in limbs with elevated post-injury ICP's. Immunohistochemistry showed the presence of the redox stress product 3-nitrotyrosine in severely injured muscle. Myoglobin in plasma was elevated 10-fold in pigs that experienced increased ICPs. Altitude exposure after injury has no effect on ICP or muscle pathology. Inflammatory cytokines are elevated however. Conclusion: We have shown that ECS with features similar to those observed in AE patients can be produced in the pig. Future studies will examine the impact of hemorrhage/resuscitation and pharmacologic agents on ECS in the AE environment.

0945 Bacterial Growth at Altitude
United States Air Force School of Aerospace Medicine (USAFSAM)/Center for Sustainment of Trauma and Readiness (CSTARS); Cincinnati, OH
Capt Ryan Earnest

OBJECTIVES: Bacterial growth is a known risk factor for tissue loss and complications in contaminated musculoskeletal wounds. Current care for these casualties includes strategic aeromedical evacuation. The effect of altitude on bacterial growth in contaminated complex wounds is unknown. We hypothesized that exposure to hypobaric hypoxia alters bacterial growth in contaminated complex musculoskeletal wounds. METHODS: We adapted a previously characterized caprine model. Under anesthesia, complex musculoskeletal wounds were created and inoculated with bioluminescent Pseudomonas aeruginosa. At 20 hours post surgery and inoculation, goats (n=5) underwent simulated aeromedical evacuation for seven hours at 8800 feet in a hypobaric chamber. Controls (n=5) were transported without flight simulation. Bacteria were quantified using photon counting at preflight (20 hours post surgery), post flight (7 hours from preflight and 27 hours post-surgery), and necropsy (24 hours from preflight and 44 hours post surgery). Results are expressed as Relative Luminescent Units (RLU) normalized to each goat’s pre-flight baseline value. Statistical analysis was performed with Mann-U-Whitney test with p<0.05 deemed significant. RESULTS: There were no deaths in either group. Each group demonstrated increasing RLU values over time (Figure 1). Goats undergoing simulated aeromedical evacuation demonstrated increased mean RLU values as compared to control animals at the post flight and necropsy time points. CONCLUSION: In the current study, simulated aeromedical evacuation resulted in increased bacterial luminescence in a contaminated complex wound. These findings are important because they suggest that hypobaric hypoxia during aeromedical evacuation may accelerate bacterial growth in contaminated wounds.

1015 Technical Evaluation of Enroute Care Mechanical Ventilation
United States Air Force School of Aerospace Medicine (USAFSAM)/Center for Sustainment of Trauma and Readiness (CSTARS); Cincinnati, OH
SMSgt Dario Rodriguez, Jr.

INTRODUCTION: Mechanical ventilation in far forward military operations requires a device that is consistent, light weight and easy to use. We evaluated the SAVe (simplified automated ventilator) in a laboratory setting to determine performance characteristics. METHODS: Three SAVe resuscitators were tested. Each was attached to a test lung with volume, pressure, and flow measured with a pneumotachometer. Compliance and resistance of the test lung were varied to simulate varying patient conditions. Oxygen was entrained at the inlet and FIO2 was measured with a fast response oxygen analyzer at the airway. All measurements were made at sea level, 4000, 8000, 12,000, and 18,000 feet. Battery life was measured twice with each device by operating it to exhaustion. RESULTS: Delivered tidal volume and inspiratory time varied when changing lung model conditions as well as between devices within the same lung model condition at sea level and at altitude. The largest reduction in tidal volume was at the lowest compliance. Measured FIO2 was comparable to
reported FIO2 although it decreased with simulated spontaneous breathing through the device. CONCLUSIONS: The SAVe resuscitator is a limited function device. Tidal volume delivery is inconsistent with decreased lung compliance and/or increased resistance. The set respiratory rate and tidal volume are not guaranteed under these conditions. During spontaneous breathing, room air is supplied to the patient. The SAVe could potentially be used for ventilatory support of carefully selected military casualties to replace manual ventilation, but caregivers must be aware of the limitations.

1045 Joint Medical Distance Support and Evacuation (JMDSE), Joint Capability
United States Joint Forces Command (USJFCOM)-J02M
CDR Greg Cook

The United States Joint Forces Command (USJFCOM) is conducting the Joint Medical Distance Support and Evacuation (JMDSE), Joint Capability Technology Demonstration (JCTD) to enable precise logistical delivery of critical, mission specific medical equipment and supplies to include telemedicine, digital patient encounter documentation, and transmission capabilities for medical first responders. These enhanced capabilities will be air-dropped by Joint Precision Airdrop Systems (JPADS) from manned and/or Unmanned Aerial Systems (UAS) to augment and extend in-place combat casualty care within forward Army, Marine Corps and Special Operations ground forces, Air Force Para-rescuers, and Navy ships/submarines with limited organic medical support. Within these combatant organizations, medics or corpsmen will be provided an on-demand capability to capture and transmit digital physiological monitoring data (i.e. blood pressure, pulse, temperature, respirations, ECG, ECO2, SP02, ventilator treatment, data elements common to the Tactical Combat Casualty Care and Field Medical Cards), and digital voice recordings of patient encounters to enable immediate telementoring and to facilitate accurate, complete point-of-injury data within permanent medical records. A set of ruggedized equipment and a lightweight digitally enabled physiological monitoring system are being integrated with military radios and soldier headset voice data capture technologies, and will be packaged for just-in-time air delivery via JPADS. A series of three 2010-11 Operational Demonstrations involving with land, air and maritime forces will be used to determine the utility of JMDSE capabilities. We discuss the technologies employed, the operational scenarios and results of the first series of exercises.

1245 Field Intravenous Fluid Reconstitution (FIVR)
Air Combat Command (ACC)/SGR, Langley AFB, Hampton, VA
LtCol Steven Stern

The objective of the FIVR project is to develop a Food and Drug Administration (FDA) approved device consisting of integrated medical components capable of producing packaged intravenous fluids for use by medical personnel in field locations. FIVR shall be capable of being employed at forward resuscitative care (or higher) deployed medical treatment facilities to provide initial resuscitative and surgical medical care to stabilize patients for evacuation to a higher level of care.

The FIVR device shall produce FDA approved IV solutions to include normal saline, half normal saline, dextrose 5% with normal saline, and lactated ringers at deployed locations for immediate use or storage. A pre-filter shall condition potable water to Environmental Protection Agency (EPA) quality where the FIVR device shall have the capability to condition the incoming water temperature; a function to sterilize the water suitable for injection; and an automated methodology to fill chemical pre-loaded bags to produce packaged intravenous solutions.

A FIVR device will culminate with FDA approval and will enhance capability reducing the medical logistical footprint and lift requirements. This operational outcome will facilitate essential care in theater and enhance care during contingencies. This capability is needed to decrease the risk of not having sufficient intravenous fluids available at deployed locations and reduce the logistical footprint (lift, storage, and waste) associated with the current operations requirement.
1315 A comparison of proximal tibia, proximal humerus and distal femur infusion rates under high pressure using the EZ-IO Intraosseous device on an adult swine model
59th Medical Wing (MDW)
Maj Julio Lairet

OBJECTIVES: Compare the intraosseous flow rates of the proximal tibia, distal femur and the proximal humerus using high pressure (>300 mmHg) in an adult swine model. METHODS: A 25mm EZ-IO needle was inserted into the proximal tibia bilaterally of eleven swine, and a 45mm needle was inserted into the distal femur and proximal humerus bilaterally. Intravascular volume was removed until the mean arterial pressure was decreased to 25% from baseline. Infusion of normal saline was carried out at each site for a period of 10 minutes with a pressure bag at highest achievable pressure (> 300 mmHg). At the end of 10 minutes infusion rates were calculated. Following euthanasia the bone IO insertion sites were harvested by the veterinary pathologist for histopathologic examination. Statistical analysis was performed using ANOVA. RESULTS: The mean infusion pressure for the tibia was 580 mmHg, 553 mmHg for the femur and 499 mmHg for the humerus. Comparing the infusion rates of the humerus (213 mL/min) to the tibia (138 mL/min) revealed a p<0.001. When comparing the humerus (213 mL/min) to the femur (138 mL/min); p< 0.001. Comparison between the tibia (103 mL/min) and the femur (138 mL/min) did not reveal statistical significance p<0.138. Histopathologic examination revealed minimal to mild subperiosteal and/or periosteal hemorrhage adjacent to where the intraosseous needle was inserted.

Conclusion: The rate of infusion was greater via the humerus route compared to the tibia and the femur. Additional studies are needed to further evaluate high pressure infusions (>300 mmHg) using intraosseous devices.

1345 Inflammation Following Hemorrhage and AE
United States Air Force School of Aerospace Medicine (USAFSAM)/Center for Sustainment of Trauma and Readiness (CSTARS); Cincinnati, OH
Tim Pritts, MD, PhD

OBJECTIVES: Hemorrhage is the leading cause of potentially preventable mortality in current military conflicts and is associated with acute inflammation. Improved resuscitation strategies are necessary for optimal outcomes, but the effect of hypobaric hypoxia on the inflammatory response to hemorrhage and resuscitation is unknown. We hypothesized that exposure to hypobaric hypoxia may alter the acute inflammatory response. METHODS: Mice underwent femoral artery cannulation and hemorrhage using a pressure-clamp model, then resuscitation with Lactated Ringer’s solution (LR) or a 1:1 ratio of fresh packed red cells and plasma from donor animals (1:1). At 1 and 24 hours following resuscitation, mice underwent simulated shock in mice. These findings suggest that the current practice of aeromedical evacuation following injury, including rapid transport to higher echelons of care, may not negatively impact the inflammatory response following hemorrhage.

1430 MAF Aircrew Fatigue Countermeasures Survey
United States Air Force School of Aerospace Medicine (USAFSAM)
Col/Dr. Jane Karen Klingenerger

No Go Pills (hypnotics) have been available to aircrews for several years for use in operational settings; however, to date there has been no assessment of their efficacy. Are Mobility Air Force (MAF) aircrews effectively utilizing pharmaceuticals that enhance sleep (hypnotics) to count the effects of “jet lag” and other operational disruptors including circadian rhythm?

Currently there are three hypnotics that are ground tested and approved for all MAF aircrews. The presentation will be a review and discussion based on a new aircrew survey and the results of a convenience sample of respondents assessing the self reported frequency and effectiveness of "No Go" medication use.

Preliminary data suggests that 40%-50% of MAF aircrews are using "No Go" medication while TDY or on overseas missions with a statistically significant difference in the length of sleep.
A Novel Approach to Zoonotic Population Health Monitoring: The Zoonoses Integration Project
82nd AMDS
Maj Thomas Doker

Zoonotic diseases comprise most of the pathogens that currently cause human disease and are potential bioterrorism and emerging infectious disease agents. Delays of various lengths can occur between initial diagnosis and reporting to local public health systems with traditional passive disease reporting. Animal reservoirs, vectors, and hosts create a multifaceted epidemiology. Environmental factors resulting from weather and geological events, human interactions, and habitat modifications affect the populations of animals within zoonotic disease chains of infection.

The Zoonoses Integration Project (ZIP) was designed to be a component of a fusion center that assimilated public health studies, general media sources, and other sources to generate a daily SA report. Many public health administrators do not have the time nor the expertise to gather information which provide the SA they require on a daily basis. Moreover, disease events in other countries can rapidly become global public health concerns.

ZIP provided linkage of pathogen selections to diseases and provided an effective way for listing existing subtypes. Options are recommended for selecting reservoir, vector, and host species. Daily multidisciplinary meetings were important for assessing the reliability, validity, and significance of collected data. More research is needed to determine the biosurveillance needs of decision makers and to evaluate the effectiveness of any public health action that occurs due to the receipt of timely and quality biosurveillance reports.

Hydroxocobalamin and Epinephrine Each Improve Survival in a Novel Swine Model of Cyanide-Induced Cardiac Arrest: A Randomized Trial
59th Medical Wing (MDW)
Maj Vik Bebarta

INTRODUCTION: Hydroxocobalamin (HOCB) is a cyanide (CN) antidote, but it has not been studied in CN-induced cardiac arrest. In addition, a clinically relevant model for drug or chemical induced cardiac arrest has not been described. HYPOTHESIS: Our primary hypothesis was that HOCB will improve survival compared to controls in a CN-induced cardiac arrest swine model. METHODS: 45 swine were intubated and instrumented and then cyanide was infused until cardiac arrest. Animals were randomly assigned to HOCB, EPI, or saline bolus. CPR was performed with a chest compression device. Vasopressor infusion (epinephrine) was used after ROSC for SBP < 90 mm Hg. RESULTS: At 2 and 4 min after arrest, coronary perfusion pressures were greater than 15 mm Hg in treatment groups. All (15) animals in the control group, 4/15 in HOCB group, and 4/15 in EPI group died (p < 0.001). ROSC at 5 min and 10 min were similar in treatment groups (p >0.9). Vasopressor infusion after ROSC was required for hypotension in 2/11 HOCB animals and in 11/11 EPI animals (p < 0.001). At 60 min, serum lactate (4.9 vs. 12.1, p<0.0001) and pH (7.34 vs. 7.153 p<0.0001) improved in the HOCB group. Serial serum CN levels in the HOCB group were lower after arrest until study end (p<0.004). CONCLUSIONS: HOCB and EPI both improved survival compared to controls in this swine model of cyanide induced cardiac arrest. HOCOB improved blood pressure, pH, lactate, and cyanide levels, and reduced epinephrine infusion use compared to the EPI group.
1400 Cold Injury in Military Population: Current Trends and Comparison to Past Conflicts with Current Research
59th 81 MSGS/SGCQ
Capt Andrew Hall

OBJECTIVE: The war in Afghanistan represents the first large-scale conflict involving military troops in a cold, mountainous climate since the Korean War. An analysis was conducted to identify the extent of cold weather injuries, especially frostbite, in the deployed military population. DESIGN: A retrospective analysis of military databases was conducted with tabulation of all cases of cold weather injuries in Operations Enduring Freedom and Iraqi Freedom. Casualties reviewed occurred between 2001 and 2009. RESULTS: A total of 19 cases of cold weather injury were identified in the Afghanistan conflict. 2 cases of frostbite were identified with only one likely requiring surgical intervention. No cases were identified in Iraq. CONCLUSIONS: The 19 cold weather injuries represents a dramatic decrease from the 6300 cases of cold weather injury seen in the last major cold weather conflict, the Korean War. This is due to the shorter and weather dependent engagements, cold weather education, and improved equipment of US and allied personnel. Discussion of research into angiogenesis using omental lipids for the treatment of frostbite and wound healing will also be discussed.

1445 The Association between Stress and Physical Fitness Testing in the 2005 Department of Defense Population Survey
United States Air Force School of Aerospace Medicine (USAFSAM)
Lt Col/Dr. Valerie Johnson

OBJECTIVE: The purpose of this study was to examine the association of perceived stress and passing the fitness test in a cohort of Department of Defense active duty members. Reports of this association have been suggested in numerous articles. METHODS: The 2005 DoD Survey of Health Related Behaviors Among Active Duty Personnel was used to examine the association between the participants’ perceived levels of stress from family and/or work related sources and the respondents’ last required fitness test taking into account potential confounder of the association. Measures of association were obtained from logistic regression models. RESULTS: Participants who experienced “some” or “a lot” of stress either from work sources (OR 0.69, 95% CI: 0.58-0.87) or from personal/family sources (OR 0.70, 95% CI: 0.57-0.86) were less likely to pass the fitness test when compared to their counterparts who experienced “none” or “a little” stress. Additionally, those who reported “some” or “a lot” of stress either from work sources (OR 0.54, 95% CI: 0.41-0.70) or from personal/family sources (OR 0.54, 95% CI: 0.44-0.67) that interfered with their military duties were also less likely to pass the fitness test. The multivariate adjustment only slightly reduced the unadjusted association. CONCLUSIONS: An association exists between perceived stress levels and outcome of fitness testing. The higher the level of stress perceived, the less likely the member will pass the fitness test. Stress-related intervention might be useful to help the military members to achieve the level of fitness needed to perform their duties.

Approved for public release; distribution is unlimited.
311 ABG/PA No. 10-202, 25 May 2010.1515

1515 The Error Rate of the Pushup Component of the USAF Fitness Assessment
19th Medical Operations Squadron (MDOS), Little Rock AFB, AR
Maj Eric Wilson

PURPOSE: To determine the Error Rate (ER) of the pushup component of the USAF Fitness Assessment. Numerous changes have recently occurred to the USAF’s fitness program. With failure rates rising steadily, there is no reliability data to date on the test’s most disputed content area. METHODS: Eight videos were made, each showing an individual performing one minute of maximum pushups while wearing one of the USAF fitness uniforms: t-shirt, long-sleeved shirt, sweatshirt, and jacket. Two videos were made for each subgroup. Ninety-two subjects undergoing PTL training (initial n=52; refresher n=40) viewed each of the eight videos once in random order and recorded the correct number of pushups performed. The primary investigator assessed the correct number of pushups by viewing the videos at ¼-speed with a grid overlapping the screen to assess elbow angles. RESULTS: ER was calculated for each subgroup (Mean, Standard Deviation, Range). The ER exceeded the number of pushups correctly performed in every subgroup. DISCUSSION: A trend in over-counting correct pushups was observed. Clothing had a significant effect on subject accuracy with t-shirts demonstrating the lowest ER compared to other subgroups. Exercise cadence, clothing variations, training and operational definitions are error sources contributing to the current grading criteria’s inconsistent implementation. Air Force training should emphasize performance and recognition of appropriate form and a “tie goes to the runner” approach for testing. Future considerations include redefining the operational definition and allotted time for the pushup test.
1545 Effects of sit-up training versus core stabilization exercises on sit-up performance: A cluster randomized trial
US Army-Baylor Doctoral Program in Physical Therapy
Lt Col John Childs, Deydre S. Teyhen, Timothy M. Benedict, Jamie B. Morris, Andrew D. Fortenberry, Rene M. McQueen, Jane B. Preston, Alison C. Wright, Jessica L. Dugan, Steven Z. George

PURPOSE: Core stabilization exercises target abdominal and trunk muscles without the excessive loading that occurs during sit-ups. However, core stabilization exercise programs (CSEP) have not been widely adopted in the U.S. Army because of the perceived deleterious impact they would have on performance during the Army Physical Fitness Test. The purpose was to determine whether performing CSEP in lieu of sit-ups during physical training would have detrimental effects on sit-up performance and passing rates on the fitness test. METHODS: Soldiers (N=2616) between 18-35 years of age were randomized to receive a traditional exercise program (TEP) with sit-ups or CSEP. Subjects with a previous history of low back pain or other injury precluding participation in training were excluded. Training programs were completed four times per week over 12 weeks. Performance was assessed at baseline and 12 weeks. RESULTS: Both groups demonstrated significant improvements in sit-up performance and overall fitness scores over time (P<0.001). There was no significance between group differences in overall fitness scores (P=0.142) or sit-up performance (P=0.543). However, CSEP resulted in a significant improvement in sit-up passing rates by 5.6% compared to 3.9% for the TEP group (P=0.004). CONCLUSION: There was a small but significantly greater increase in sit-up pass rate in the CSEP (5.6%) versus the TEP group (3.9%). Incorporating CSEP into Army physical training does not increase the risk of suboptimal performance on the Army’s fitness test and may offer a small benefit for improving sit-up performance.

Wednesday, 25 August 2010

0830 The Evaluation of Nanoparticles as Biological Decontaminants
United States Air Force School of Aerospace Medicine (USAFSAM)/PHT, Brooks City Base, TX
Clarise R. Starr, PhD, George F. Viale, MSgt, USAF, NCOIC, Linda S. Armstrong, MS, Manuel Y. Caballero, BS, and David L. Maserang, PhD

Nanoparticles are insoluble particles that are no greater than 100 nm in size and are reported to have various electronic, magnetic and optical properties associated with them. Recent studies have demonstrated the unique anti-microbial and toxin neutralizing potential of these particles. The objective of this study is to find a universal nanoparticle formulation that is capable of killing Gram positive, Gram negative and spore forming bacteria and viruses, thus providing a potential alternative as a decontaminating solution in hospitals and laboratories, and have the ability to neutralize two common biothreat toxins, C. botulinum A and Staphylococcus enterotoxin B. This research has 3 specific aims: 1) To test a series of commercially based nanoparticle solutions (AgO, MgO and ZnO) with and without halogenation in liquid, powder, and gel matrices in order to find the top 4 solutions that can work on all 4 microorganisms and 2 toxins. 2) To test the top 4 formulations against various clinical and environmental matrices and surfaces to determine strengths and limitations and 3) To further test the safety of these formulation against established assays for possible deleterious effects against the end-user, if any, by established cell culture toxicity studies. This study utilizes commercially available nanoparticle reagents.

0800 Embedded Fragments - A Unique Exposure Situation and Concerns of Possible Health Effects
Armed Forces Institute of Pathology
Jose A. Centeno

BACKGROUND: The majority of modern war wounds are characterized by high-energy blast injuries containing a wide range of retained foreign materials of a metallic or composite nature. Health risks of retained fragments such as local or systemic toxicities, and delayed outcomes such as foreign body reactions or malignancies, are dependent of the chemical composition of the fragments and need to be further understood. Information obtained by chemical analysis of excised fragments can be used to guide clinical decisions regarding the need for fragment removal, to develop therapeutic interventions, and to better manage potential future medical problems arising from retained fragment related injuries. OBJECTIVES: The objective of this study is to define the chemical composition of retained embedded fragments removed from injured military personnel, and to relate results to histological findings in tissue adjacent to fragment material. RESULTS: Most fragments were obtained from penetrating wounds sustained to the extremities, particularly soft tissue injuries. The majority of the fragments were composed of single metals such as iron, copper, and aluminum with traces of antimony, titanium, uranium, and lead. CONCLUSIONS: The present study provides a systematic approach for obtaining a full chemical characterization of retained embedded fragments. Given the vast number of combat casualties with retained fragments, it is expected that fragment analysis will have significant implications for the optimal short and long-term care of wounded service members.
that could be modified to work effectively as a universal decontaminant solution that is safer and less caustic than most off-the-shelf alternatives, such as bleach and in the case of anthrax decontamination, chlorine dioxide gas. The ideal solution would be easy to transport, safe for the end-user to manipulate with minimal protective gear, and effective against bacteria, viruses, and toxins in a short contact time.

0900 Toxicology & ESOH Issues of Engineered Nanomaterials
711th Human Performance Wing (HPW)/RHPA
Saber Hussain, Laura Braydich-Stolle, Nicole Schaeublin, David Mattie

Recent developments have generated a degree of apprehension concerning potential environmental, safety and occupational health (ESOH) risks associated with new, engineered nanomaterials. We are conducting focused research to establish the possible effects of nanoparticle exposure on biological systems. There are a great variety of physiochemical properties such as size, shape and surface chemistry of nanoparticles, which can contribute to nanotoxicity and this makes the safety assessment a challenging problem. We have established a lung co-culture model that simulates the human lung environment to evaluate the respiratory toxicity of nanoenergetic materials. We have demonstrated that there is a size dependent toxic effect of silver and silica nanoparticles, while in terms of gold nanotoxicity size, charge, and shape were mediating factors. When keratinocytes were exposed to gold nanospheres and rods, the rod shaped gold induced more toxicity. Furthermore, charged gold nanoparticles induced apoptosis, while neutral gold nanoparticles did not. Additionally, studies with nanoenergetic aluminum have demonstrated that at low levels of exposure there was little toxicity in the lung co-cultures, however, the immune cells ability to respond to bacterial pathogens was reduced. Taken together, all of these nanotoxicity studies demonstrate that there are multiple parameters that will contribute to how nanomaterials interact with a biological system and it is imperative to characterize these materials in order to fully understand the biological responses. The main focus of this presentation will be to discuss basic research applied to discover biological interaction of nanomaterials and its relationship to potential human health concerns.

0945 Evaluation of Jet Fuel Induced Hearing Loss in Rats
711th Human Performance Wing (HPW)/RHPA
David Mattie, PhD

Noise-induced hearing loss (NIHL) continues to be a major military operational problem as well as a general occupational health hazard. Twenty-eight-day studies with male and female rats were designed to study the combined JP-8 jet fuel and noise effects on hearing loss. The first study was a baseline study for creating noise levels similar to occupational exposure. Rats were exposed to 0, 75, 85 or 95 dB for 6 hours per day, 5 days per week over 4 weeks. The second study will be an occupational exposure to noise combined with JP-8 to investigate the combined effects of jet fuel and noise on hearing loss. For noise exposure, audio editing software was used to filter and equalize a white noise file to one octave-band wide, centered at 8 KHz. The signal was split into three equalizers and amplifiers for producing the three noise levels generated using electrodynamic shakers mounted to the exposure chambers. In the first noise-only study, hearing loss was tested by performing the distortion product otoacoustic emission (DPOAE) test used to evaluate hearing function and the compound action potential (CAP) test to determine hearing threshold. Following the hearing assessment, microscopic examination of tissue in the cochlea of the inner ear was conducted to determine the percentage of hair cell receptor loss. All data from the first study showed significant effects on hearing at 95 dB with little or no effects at 75 dB, thus supporting the use of 85 dB for subsequent noise exposures.

1015 Toxicity and Health Hazard Assessment for Synthetic Paraffinic Kerosene
711th Human Performance Wing (HPW)/RHPA
David Mattie, PhD, John Hintz, PhD

The U.S. Air Force is pursuing the development of alternative fuels. One jet fuel, designated as Synthetic Paraffinic Kerosene (SPK), is produced from natural gas using the Fischer-Tropsch (F-T) process. The toxicology experimental results for SPK showed that dermal irritation was slight to moderate and genotoxicity studies were negative. Results for the acute inhalation study, in which male and female rats were exposed to 2000 mg/m3 for 4 hours, revealed no abnormal clinical observations. In the two-week range finder study, male and female F344 rats were exposed for 6 hours per day, 5 days per week to an aerosol-vapor mixture of SPK jet fuel. Histological findings in the nasal cavities were minimal (700 mg/m3) to mild (2000 mg/m3) for 4 hours, revealed no abnormal clinical observations. In the two-week range finder study, male and female F344 rats were exposed for 6 hours per day, 5 days per week to an aerosol-vapor mixture of jet fuel (0, 500, 1000 or 2000 mg/m3). Based on results of the two-week study, male and female F344 rats were exposed for 6 hours per day, 5 days per week for 90-days to an aerosol-vapor mixture of 0, 200, 700 or 2000 mg/m3 SPK jet fuel. Histological findings in the nasal cavities were minimal (700 mg/m3) to mild (2000 mg/m3), while only the high dose (2000 mg/m3) produced multifocal inflammatory cell infiltration in rat lungs (both sexes). The 50% respiratory depression (RD50) value from the sensory irritation inhalation study was calculated to be 10,939 mg/m3. In a comparative health hazard assessment (HHA), these SPK results were compared to JP-8. SPK appeared moderately less toxic or irritating than JP-8 under similar exposure conditions. An Occupational Exposure Limit (OEL) for SPK was
proposed to be 200 mg/m³, which is the current limit set for JP-8. Supported by AFMC 77 AESW/LF.

1045 Cellular Bioeffects Thresholds for Terahertz Frequency
711th Human Performance Wing (HPW)/RHDR/AFRL 8262 Hawks Rd, Brooks City-Base, TX 78235
Gerald Wilmink, DRII/Biomedical Engineer

The Terahertz (THz) region of the electromagnetic (EM) spectrum is defined as frequencies ranging from 0.1 to 10 THz. Historically, few sources have been available for this region; however, in recent years, several advances have been made in THz source development. Such advances have enabled numerous “real world” applications. For instance, THz techniques are now being used for security purposes to identify concealed explosives, drugs, and weapons. However, despite efforts to develop these applications, the bio-effects associated with THz radiation are not well characterized.

In this study, we used computational and empirical spectroscopy system to measure the optical properties of molecular pumped THz source; and (3) Developed computational modeling algorithms to predict dosimetry and damage thresholds.

To examine THz-cellular effects we conducted the following: (1) Developed computational models to predict dosimetry and cell death-thresholds for THz-exposed cells; (2) Empirically determined cell-death thresholds using a THz laser, infrared camera, MTT assays, flow cytometer, confocal laser scanning microscope, and several adherent and suspension cell lines (e.g. Hela, NHDF, Jurkat).

Last, to examine THz-biomolecular effects, we used molecular dynamics modeling and empirical approaches. Specifically, we used genomic and transcriptomic analysis techniques (microRNA/mRNA microarray gene chips and qPCR) to characterize the cell’s molecular response to THz radiation.

1245 Development of a Health-Belief-Model-Based Instrument to Assess Worker Beliefs about using PPE
Utah Air National Guard
LTC Jack Wall

Occupational illness is an identified problem in the United States Air Force (USAF). Of the many occupational illnesses reported annually, most are preventable through the use of personal protective equipment (PPE). The purpose of this study was to develop an instrument to assess the significance of the determinants that predict the use of PPE in small industrial USAF shops. The focused aim of the study was to develop a valid and reliable theory-driven instrument, specific to the military, assessing these determinants resulting in effective interventions. The health belief model was used as the theoretical basis for the instrument.

The procedures employed USAF expert and employee focus groups to establish instrument validity. A two-judge content validity index was calculated using judges from the expert focus group. Reliability was established by test-retest administration of the instrument. An analysis of Cronbach’s alpha was used to assess the test-retest reliability of the health belief model constructs.

The focus groups established that the instrument is valid. Reliability of the instrument varied by construct, with the majority of the constructs having sufficient reliability to make the instrument useful for assessing determinants of behavior contributing to the use of PPE. More research is recommended to enhance the reliability of the instrument and to demonstrate equal value in the non-military situation. The developed instrument fills a need for theory-based instruments that can be used to plan theory-driven interventions that target increasing appropriate PPE use.

1315 Nucleic Acid and Protein Detection Technology: Limitations, Milestones, and the Continuous Search for the Holy Grail
United States Air Force School of Aerospace Medicine (USAFSAM)/PHT, Brooks City Base, TX
Clarise R. Starr, PhD

Successful detection of pathogens and toxins in a deployed situation is only as good as the technology that is implemented. The field of nucleic acid and protein detection is evolving, with transformation to smaller instrumentation with greater computing power that can provide more information faster in a single assay. However, by the time one instrument has been evaluated for potential use, it is quite common for another generation of technology to be released. The current topic will focus on trends in this field, and discuss currently fielded instrumentation for nucleic acid and protein detection utilized by the USAF and the DoD. Our evaluations of Film Array and Meso Scale PR2, two new instruments that are thought to be the next generation of nucleic acid and protein detection, respectively, will be presented. In addition, the journey to generating a single platform for both pathogen and toxin detection will be discussed with emphasis on current and future technologies that may eliminate the foreknowledge needed to design target specific assays.
James Baldwin, DR02/Molecular Biologist

Pyrosequencing is an excellent way to detect clinical infections. Unlike PCR-only assays, the pyrosequencer can discriminate sequences based on DNA sequence. Sequence evaluation allows precise detection while often providing the serotype of the detected organisms. Under investigation is the use of deeply multiplexed PCR tests followed by a rapid pyrosequencing step to identify detected organisms. The test uses low-specificity primers to amplify related sections of important upper respiratory virus genomes. The exact identity of any given product is then determined by DNA sequencing short sections of the PCR product (up to 50 bp). The sequences are used as tags to accurately identify organisms from a database of possible results extracted from Genbank. Assays were designed for the pyrosequencer to detect and serotype influenza (A, B, C), several human coronaviruses (HKU1, NL63, 229E, OC43, SARS), adenovirus (most serotypes including 3, 4, 7, 11, 14, 21), parainfluenza (1, 2, 3, 4), metapneumovirus, Picornaviridae (most rhinovirus, enterovirus, Coxackie virus, echovirus, and poliovirus), and respiratory syncytial virus (A, B). The assays were designed to work in a single multiplexed tube and as individual tests. Results indicate that adenovirus, coronavirus, and Picornaviridae assays offer a robust detection and identification method. In some assays (Picornaviridae, for example) we can theoretically detect/serotype over 100 viruses in a single test by sequencing less than 25 bp. This work is designed to support the public health mission of the DOD through enhanced diagnostic testing of clinical samples, including those from the recruit and enlisted populations.

Lt Col/Dr. Christopher Hudson

The increasing availability of lasers has led to a proliferation of laser illuminations of airplane cockpits and crews during flight. Such illuminations not only present flight safety issues such as distraction or visual disturbance, they could in some cases result in damage to the retina. The United States Air Force Special Operations Command (AFSOC) has initiated retinal photographs for its aircrew to be used in the event of a laser eye exposure incident. Since 2004, all flyers were required to have a reference retinal photograph to use as comparison to their exam after a laser exposure. The intent of the retinal photograph is to enhance the ability of the examining provider to detect laser associated retinal damage. The frequency at which such retinal photographs should be repeated as a screening exam has not been determined. The purpose of this study is to examine retinal photographs of AFSOC flyers as a screening exam. As with any screening exam, the factors to consider are the incidence and prevalence of the condition, the sensitivity and specificity of the screening exam, the cost effectiveness of screening, the appropriate screening interval and any unintended consequences related to screening. After considering each of these factors, our recommendation is that baseline retinal photographs for AFSOC flyers are not recommended as an effective as a part of a medical surveillance screening program for potential laser eye injuries. This recommendation is based on the lack of injuries reported in aviators, the limited number of documented ACS injuries over the past 15 years, the cost and lost work time associated with screening and the limited use as a screening tool.

1500 Visual Performance Enhancement with Macular Pigment in Glare Condition
AFRL 711th Human Performance Wing (HPW)/RHDO
Dr. Leon McLin

PURPOSE: Macular pigment’s presence in the fovea is thought to enhance visual performance in glare. This study sought to determine if differences in macular pigment optical density (MPOD) are associated with differences in 3 measures of visual performance under conditions of glare: 1) photostress recovery, 2) disability glare, and 3) visual discomfort. METHODS: Spatial profiles of MPOD were assessed for twenty-six subjects with heterochromatic flicker photometry. Glare was delivered dioptrically, in free-view, via two bright white LEDs. For the disability glare and photostress recovery conditions, the visual task consisted of determining the contrast threshold for correct identification of a 1degree Gabor patch’s orientation. Visual discomfort was assessed with a visual discomfort rating scale. Pupil diameter was monitored with an IR camera. RESULTS: Low MPODs were associated with higher visual discomfort ratings. Thresholds for correct identification of a 1degree Gabor patch were significantly lower for high MPOD conditions. CONCLUSIONS: Macular pigment improves three aspects of visual performance in glare. Unlike previous studies, the present study used free-viewing conditions so effects of iris pigmentation and pupil size could be accounted for. Therefore, the effects described can be extended more confidently to “real-world,” practical visual performance benefits.
1530 Identification of Serum Biomarkers of Directed Energy Induced Retinal Injury
United States Army Medical Research Institute of Chemical Defense (USAMRICD)

LTC Deborah Whitmer, 62nd MEDBDE Theater Veterinarian

MILITARY SIGNIFICANCE: Today on the battlefield military personnel are exposed to numerous non-kinetic ballistic risks to their vision such as directed energy (laser) sources and non-penetrating blast effects. Detection of subtle non-penetrating blast and directed energy retinal injuries by retinal specific biomarkers is a desirable field diagnostic capability. OBJECTIVE: Determine if specific retinal biomarkers are measurable in serum after discrete DE retinal injuries occur. METHODS: Laser lesions were created in both eyes of anesthetized non-human primates (NHPs) (n=20 animals). An alpha-2-agonist and non-steroidal anti-inflammatory were administered topically concurrently with a unilateral intravitreal injection (saline or steroid) then evaluated for effects on lesion healing. Serum samples were collected from all NHPs pre and post DE exposure then at regular intervals during the treatment phase and at the terminal end point (minimum of 180 days post retinal injury). The levels of cytokines and chemokines were determined in serum using Millipore’s MILLIPLEX™ Non-Human Primate Cytokine kit. The assay coupled with the Luminex xMAP® platform, simultaneously quantified 23 human cytokines and chemokines. RESULTS: Six of 23 assayed serum cytokines/chemokines were detectable at all time points from injury to end point in all NHPs tested. CONCLUSIONS: Preliminary results indicate that specific serum cytokine/chemokines biomarker(s) exist for discrete DE induced retinal injury.
Tuesday, 24 August 2010

1300 Secondary Insults of Traumatic Brain Injury in CCATT Patients Returning from Iraq/Afghanistan
United States Air Force (USAF), University of Maryland; Baltimore, MD
Maj Susan Dukes

BACKGROUND: Traumatic brain injury (TBI) patients are highly susceptible to secondary insults to the injured brain (e.g., hypoxia, hypotension, hyperthermia, hypothermia, and hyperglycemia). Over one third of the patients transported by Critical Care Air Transport Teams (CCATT) have had TBIs. Considering CCATT patients travel thousands of miles, pass through multiple hospital systems, and are exposed to the stresses of flight on military cargo aircraft, the occurrence and timing of these secondary insults need to be explored. PURPOSE: This study describes the occurrence of secondary insults in isolated TBI patients transported by CCATTs from the point of injury to arrival in the United States between 2001 and 2006. METHODS: A descriptive retrospective cohort design was used to conduct a secondary analysis of 64 CCATT patients with isolated TBI from the Wartime Critical Care Air Transport Database. Data elements in the database were abstracted from existing records including theater trauma registry, transport documents, flow sheets, and hospital medical records. RESULTS: Over half (52%) of the study patients developed at least one secondary insult before returning to the US. Hyperthermia (47%) followed by hypoxia (27%) occurred at the greatest rates. The greatest occurrence of hyperthermia was reported during the patients’ stay at Landstuhl Regional Medical Center (LRMC)(40%) and the CCATT transport from LRMC to the US (41%). The greatest occurrence of hypoxia was reported while the patients were still in theater (30%). Data analysis is ongoing.

1330 Iron Status of Deployed Military Members
59th CSPG/SGVUS
Maj Candy Wilson

The purpose of this study is to determine the iron status of deployed military personnel, specifically the prevalence of iron deficiency (ID)/iron deficiency anemia (IDA) while stationed at moderate altitude. Iron is a prerequisite for the production of new red blood cells. In the event of reduced availability or iron, one can develop ID and IDA. ID/IDA causes a reduced oxygen carrying capacity. The prevalence of women and men with ID in military training environments is between 11-44% and 3-33%, respectively. ID/IDA has been known to impair physical and cognitive functioning. The research questions are:

What is the iron status of a deployed sample at moderate altitude?

Is there a difference in the prevalence of ID/IDA between deployed men and women?

Is there an increased incidence of ID/IDA in deployed women who have menstruation as compared to deployed women who do not have menstruation?

This study is a descriptive correlational research design. The researchers will examine the relationships between home station altitude, history of anemia, recent blood donation, vegetarian diet choice, and multivitamin us to blood results. For women, researchers will determine if a correlation between menstrual history and iron status exists. Blood analysis will include hematocrit, hemoglobin, mean corpuscle volume, iron, total iron binding capacity, Ferritin, and soluble transferrin receptor. The sample will consist of service members deployed greater than three months at Bagram Airfield Afghanistan. The projected sample size is 400 (200 mean, 200 women). ID/IDA is a significant impediment to a fit, healthy, and functioning military force. The identification of risk factors contributing to ID/IDA among active duty U.S. forces in a deployed environment will lead to interventions that improve the combat power and effectiveness of the U.S. military. This study will be completed 30 May 2010.

1400 Air Force Nurse Transition Program
88th MDG
Col Robie Hughes

BACKGROUND: The Air Force Nurse Transition program was established in 1977 for Air Force nurse accessions with less than one year of clinical experience as a registered nurse. Today the program is held at 8 military and 2 civilian training sites. The course length varies according to location. At military training sites the course length is 11 weeks long. At the civilian locations (Cincinnati and Scottsdale) the course has been reduced to 9 weeks because students completed clinical skills requirements quicker due improved access to patients. No research studies on the measurement of nursing performance related to the Air Force Nurse Transition program has been published. SPECIFIC AIMS: 1) Implement valid and reliable instruments to
measure nurse transition student performance during medical simulation scenarios. (2) Establish base line data on new nurse accessions’ performance upon entrance to the military and prior to attending the Air Force Nurse Transition Program based on the simulation scenario evaluation instruments. (3) Determine the impact of the Air Force Nurse Transition Program on graduates’ performance during medical simulation scenarios based on the Simulation Evaluation Instrument. (4) Compare military nurses enrolled in the Air Force Nurse Transition Program at civilian training sites to those at the military training sites in terms of pre and post attendance subscale scores on the simulation scenario evaluation instruments. METHOD: Samples (multisite) Repeated Measurement Pre-test/Posttest Comparative design. Each group at one of 10 sites is evaluated using a simulated medical scenario prior to attending and upon completion of the Air Force Nurse Transition Program. No control group will be used for this study because it is not feasible to have a “no training” group, nor to have subjects act as their own control for the same length of time (9 to 11 weeks) as in the training program. Findings: To be determined. At the time of the AFMS Symposium, 8 classes of NTP students (28 total classes projected for FY 10) will have gone through the study pre and post NTP. Data collected from the 8 classes will be presented as findings during the presentation. DISCUSSION: Information will be discussed regarding the partial findings from this study. The data collection will continue through 17 Dec 10.

1445 Inpatient Glycemic Management Team at Wilford Hall Medical Center
Wilford Hall Medical Center (WHMC)
Stacey Ward, MSN, RN, CNS-BC, BC-ADM, Lexa Rijos, MSN, RN, ACNP-BC, Linh Reeves, MPAS, PA-C, Joe Pollard, MPH, Mark W. True, MD, and Brian T. Allenbrand, MD

Best practices direct hyperglycemic management in the acute care setting to be at the forefront of providing quality care for either hospitalized diabetic or non-diabetic patients. As demonstrated by current research, sustained hyperglycemia results in increased hospital length of stays and infection rates. As part of the American Diabetes Association and The Joint Commission inpatient diabetes recognition program, an attribute for success is having an identified program champion team. In August, 2009 Wilford Hall Medical Center, an Air Force medical center in San Antonio, TX, formed an inpatient glycemic management team (IGMT) comprised of mid-level providers to include a nurse practitioner (NP), physician assistant (PA), and clinical nurse specialist (CNS). One role of the team is to consult and provide recommendations for glycemic management strategies in the critically and non-critically ill patients while monitoring blood glucose rates for hypoglycemia (< 70 mg/dl). From September 2009 to February 2010, the rate of acceptance of recommendations provided was 90.2%. Comparing September 2008- February 2009 to September 2009 - February 2010 for overall hypoglycemia in the non-critically ill was 2.4% and 1.7%, and hyperglycemia (> 180 mg/dl) was 31% and 30%, respectively while the critically ill population had an overall rate of hypoglycemia of 1.7% and 1.5%, respectively. As evidenced by an overall acceptance of recommendations demonstrating a decline in hypoglycemia and hyperglycemia rates, using an IGMT to direct inpatient hyperglycemic care is an effective methodology of providing best practices for this patient population.

1515 Diabetes Self-Management Education at a Military Hospital
University of Pittsburgh Medical Center (UPMC)
Ellen Kilpatrick, RN, CDE, Nina Watson, RN, CDE, Joseph Pollard, MPH; Acknowledgements: Linda Siminerio*, RN, PhD, Kristine Ruppert*, DrPH

BACKGROUND: Diabetes self-management education (DSME) is considered to be an important part of management and has been directly associated with a decrease in HbA1c levels. Patients who do not receive DSME are found to be four times more likely to develop a major complication and incur higher diabetes-related hospital costs. Self-management is considered to be a key component of the Chronic Care Model (CCM). As part of our effort to deploy the CCM in a military environment, we established a Diabetes Center of Excellence (DCE) at Wilford Hall Medical Center (WHMC) for high risk diabetes patients. The DCE included an ADA recognized program. Our objective was to determine the impact of DCE patients who received DSME on HbA1c levels. METHODS: Patient military beneficiaries who received DSME between January and December 2009 with at least 1 recorded baseline and follow-up HbA1c were included in the analysis. RESULTS: A total of 207 patients (mean age 58 years, 51% male, 43% Caucasian, 29% Hispanic, and 22% African American) participated. Prior to program 39.6%; post program 17.4% had HbA1C >8%, representing an overall 1.1% HbA1c reduction. 69.6% of patients showed improvements. After adjusting for pre HbA1c and race, completing the DSME classes showed a significant decrease (p<0.001). CONCLUSIONS: These findings demonstrate the added benefit of integrating a formal DSME program in diabetes specialty clinics for military beneficiaries. DSME can be considered an important adjunct in diabetes specialty care.
## Closing Plenary Session

*Presentation slides are in appendices as noted.*

<table>
<thead>
<tr>
<th>Topic</th>
<th>Presenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood Pharming</td>
<td>Dr. Stewart Abbot</td>
</tr>
<tr>
<td><em>(See Appendix G)</em></td>
<td>Celgene Cellular Therapeutics</td>
</tr>
<tr>
<td>Mild Traumatic Brain Injury and Sleep</td>
<td>Dr. Michael Russo</td>
</tr>
<tr>
<td><em>(See Appendix H)</em></td>
<td>Traumatic Brain Injury Neurologist</td>
</tr>
<tr>
<td>Defense Centers of Excellence (DCoE)</td>
<td>Dr. George Johnson</td>
</tr>
<tr>
<td><em>(See Appendix I)</em></td>
<td>TBI Directorate</td>
</tr>
<tr>
<td>DoD “Use of Laboratory Animals” Updates</td>
<td>COL Annette Hildabrand</td>
</tr>
<tr>
<td>Simulation Training Research- Trauma Man</td>
<td>Deputy Director, Animal Use Programs</td>
</tr>
<tr>
<td><em>(See Appendix J)</em></td>
<td>Capt Andrew Hall</td>
</tr>
<tr>
<td>Joint Technical Coordinating Group (JTCG) Updates</td>
<td>Col Ray Santullo</td>
</tr>
<tr>
<td><em>(See Appendix K)</em></td>
<td>Air Force Liaison to JTCG</td>
</tr>
<tr>
<td>Leadership Brief</td>
<td>Lt Gen Bruce Green</td>
</tr>
<tr>
<td></td>
<td>Air Force Surgeon General</td>
</tr>
</tbody>
</table>
Poster Abstracts
1. Genetic Factors Influencing Rate of Moderate Altitude Acclimatization and De-acclimatization

United States Air Force Academy (USAFA)

Chloe J. Angello, Jeffery L. Nelson, Michael F. Zupan, Rebecca M. Gulledge, Camilla A. Mauzy, Brandon K. Doan, and Michael D. Brothers

INTRODUCTION: Previous U.S. Air Force Academy (USAFA, 2210m) research has demonstrated significant physiological adaptations to moderate altitude (MA; > 1500m). These studies have also revealed tremendous individual variability in acclimatization and de-acclimatization rate, which may be influenced by genetic factors. PURPOSE: To investigate the rate of adaptation and de-adaptation to long-term MA exposure and possible underlying genetic factors by analyzing hematological and genetic data among USAFA cadets. METHODS: Total hemoglobin mass (THM) was repeatedly assessed among sixty freshmen (42 males, 18 females) age 18.3 ± 0.4 years who were categorized based on hematological adaptation rate. Various genetic factors associated with altitude were assessed and significant (p < 0.05) differences and correlations examined. These genetic factors included: angiotensin-converting enzyme (ACE) I/D; endothelial nitric oxide synthase (eNOS) 4b/a and Gln298Asp; endothelin-1 (ET-1) Lys198Asp; hypoxia-inducible factor-1 (HIF-1) Ala588Thr and variable number tandem repeats (VNTR); heat shock protein 1B (HSPA1B) A/G; vascular endothelial growth factor (VEGF) G/T; VEGF receptor 1 precursor (VEGFR) C/T; and heme oxygenase-1 (HO-1) VNTR. RESULTS: Significant (p < 0.01, r > -0.432) correlations were evident between the rates of MA acclimatization, de-acclimatization, and re-acclimatization among former SL subjects. Additionally, the acclimatization rate was significantly (p < 0.05, r > 0.23) correlated with the tested genetic variants. These associations included the eNOS and ET-1 mutations, both genetic variants commonly found in Sherpa populations naturally adapted to high altitude. CONCLUSION: Our results indicate that some of the variability in MA acclimatization may be explained by individual genetic differences. Future research is warranted.

2. A pilot’s ability to properly identify and react to flying emergencies will improved with a five-week sports vision training program

87th AMDS/SGPE

Maj Richard Baird

The purpose of this study is to assess whether a pilot’s ability to properly identify and react to flying emergencies will improved with a five-week sports vision training program. Professional, Olympic, and college athletes use sports vision training in order to improve their performance. The tachistoscope and the Sports Vision Trainer (SVT) have been designed to significantly increase the ability to more quickly and accurately perceive and react to stressful events in three ways: 1) Expanding peripheral/situational awareness, 2) Accelerating reaction/response speed and 3) Providing pinpoint eye-hand coordination. Anecdotal reports showcase dramatic results, but minimal research has been undertaken to verify the nature of the improvement.

The preparation for and stresses of war have been compared with those of athletic competition. Research has shown that, pilot visual abilities and demands, like those of athletes, are superior to those of the average individual. Flying a plane--especially during wartime--brings its own set of stresses and visual stimuli necessitating proper awareness/judgment and accurate motor output.

Volunteer air-crew members from Jt Base McGuire-Dix-Lakehurst are participating in the study. Each receives initial SVT, tachistoscope and C-17/KC-10 simulator check-ride testing along with a questionnaire. Subjects will practice on the SVT or tachistoscope for 30 minutes, three times a week for five weeks. Controls will spend similar time reading technical instructions on how to identify and react to emergencies. After the training period, all participants receive the same testing sequence as a post-test. Improvements in check-ride performance will determine the validity of the training.
3. Advanced and novel neurological measurements in a model of critically ill cyanide toxicity
59th MDW Wilford Hall Medical Center (WHMC)
Dr. Vik Bebarta

BACKGROUND: Cyanide is a commonly used terrorism weapon and is product of combustion in structural and vehicle fires in garrison. Previous rudimentary measurements have focused on a lactic acidosis. We have recently described hypotension and cardiovascular hemodynamics resulting from cyanide toxicity.

OBJECTIVE: To evaluate the electrocardiographic (ECG) measurements, invasive brain tissue microdialysis metabolites, and noninvasive brain near infrared spectrometry (NIRS) as novel or bedside measurements of cyanide toxicity.

METHODS: 24 swine were intubated and instrumented. A continuous cyanide infusion was started, until the development of severe hypotension (50% of baseline MAP). Animals were randomly assigned to intravenous or intraosseous hydroxocobalamin and monitored for 60 minutes after the start of antidotal infusion. Group size analysis based on a power of 80% yielded a sample size of 12 animals per group for comparison.

RESULTS: We have interim analysis data. 1 animal in each arm died thus far. ECG findings were significant and showed ST depression and interval width changes. NIRS shows a significant decline during cyanide infusion and rise with antidote administration. Microdialysis collection is still in preparation. Samples has been collected but not completed. Preliminary animals showed a rise in brain acidosis. The animals developed hypotension, lactate acidosis, and recovery similarly to our previous models.

CONCLUSION: We are evaluating novel and noninvasive measurements of cyanide toxicity. These measurements may be able to detect cyanide toxicity at the bedside rather than cyanide levels which cannot be routinely. In addition, these measurements may be able to prognosticate cyanide toxicity better than current methods.

59th Radiology SQ, Lackland AFB
Maj Nathan Cecava

Traumatic brain injury (TBI) and post-traumatic stress disorder (PTSD) have increasingly impacted the health and wellbeing of many of our military members and veterans. Diagnosis and quantification of disease has largely relied upon extensive clinical evaluation of diseased and non-diseased individuals. In many cases, diagnosis is delayed secondary to late symptom onset. These disease entities are rarely evident on conventional brain imaging, however, advances in magnetic resonance (MR) imaging, including functional MR, diffusion tensor imaging, and volumetric imaging in addition to conventional gradient echo imaging yield exciting new possibilities in objective assessment to aid diagnosis and treatment.

The objective of this presentation is to demonstrate the advanced imaging techniques used in the San Antonio Military Medical Center (SAMMC) evaluation of TBI and PTSD in the acute and chronic clinical settings. Diffusion tensor imaging is utilized to pinpoint diffuse axonal injury in mild to moderate traumatic brain injury, occult in conventional imaging. Functional MR provides non-invasive identification of specific brain foci of disease in PTSD during clinical testing. Volumetric imaging of select brain anatomy is utilized to assess TBI/PTSD severity and treatment response.

These imaging modalities are in their infancy, but offer great hope in early diagnosis to prevent compounding injuries, and provide objective assessment of disease progression and treatment success. SAMMC Neuroradiology has found these advanced MR techniques to be increasingly beneficial in supporting the military patient population and aiding our referring clinicians.
INTRODUCTION: USAF Remotely Piloted Aircraft (RPA) MQ-1 Predator and MQ-9 Reaper Sensor Operators (SOs) have a pivotal role in reconnaissance, surveillance, & precision strike aerial operations. They are central to safe and efficient identification, targeting, and battle damage assessment of enemy combatants and assets. Although comprehensive job analyses have been conducted and human performance models of RPA SOs proposed, there is currently no operationally defined list of psychological attributes critical to the performance of RPA SOs to guide aeromedical assessment & selection procedures. METHODS: To fill the current gap, the authors of this study conducted several standardized individual and group interviews with MQ-1 and MQ-9 subject matter experts (N=68; line commanders, pilots, sensor operators, and instructors) from ACC and AFSOC operational squadrons to: (a) review the duties of SOs, and (b) identify the psychological attributes considered critical to distinguishing successful RPA SOs from training failures and those with chronic performance problems. RESULTS: The results of the study are organized into an aeromedical list of operationally defined psychological attributes deemed critical to training and operational performance (i.e., cognitive proficiency, visual spatial processing, memory, vigilance, dexterity, reasoning, stamina, resilience, confidence, assertiveness, cohesiveness, flexibility, conscientiousness, adaptability, and motivation). DISCUSSION: The list of attributes deemed critical to performance by SMEs enhances communication between RPA operators, line commanders, and aeromedical providers regarding unique psychological demands of RPA SO duties. Such attributes can be measured and quantified using objective standardized instruments (e.g., intelligence testing) and compared with performance evaluations to improve aeromedical assessment & selection procedures.

INTRODUCTION: USAF Remotely Piloted Aircraft (RPA) MQ-1 Predator and MQ-9 Reaper pilots have a pivotal role in reconnaissance, surveillance, and precision strike aerial operations. The demand for such pilots in current theaters of conflict is rapidly increasing. As a result, a high level of medical attrition among incumbents and trainees is unacceptable. Although comprehensive job analyses have been conducted and taxonomy of knowledge skills and abilities proposed, there is no clear operationally defined list of psychological attributes critical to the performance of RPA pilots to guide aeromedical assessment and selection procedures. METHODS: To fill the current gap, the authors of this study conducted several standardized individual and group interviews with MQ-1 and MQ-9 subject matter experts (N=87; line commanders, pilots, and instructors) from ACC and AFSOC operational squadrons to: (a) review the duties of RPA pilots, and (b) identify the psychological attributes considered critical to distinguishing successful RPA pilots from incumbents and trainees with performance and adaptation problems. RESULTS: The result of this study is an aeromedical list of operationally defined attributes organized into cognitive (e.g., cognitive proficiency, visual spatial abilities, memory, vigilance, reasoning), personality (e.g., composure, perseverance, adaptability, conscientiousness), and motivational (moral and occupational) attributes deemed critical to RPA pilot performance. DISCUSSION: The list of attributes deemed critical to performance by SMEs enhances communication between RPA operators, line commanders, and aeromedical providers regarding the unique demands of RPA pilot duties and operations. Such attributes can be measured and quantified using objective standardized instruments (e.g., intelligence testing) and compared with performance evaluations to improve assessment & selection procedures, as well as aeromedical evaluations. This study also provides recommendations for
7. Using Radio Frequency Identification (RFID) to improve your clinical process and patient safety
Shipcom Healthcare
Scott Cobb

Shipcom Healthcare has implemented an enterprise RFID system and other Automatic Indentification Data Collection (AIDC) technologies at Keesler AFB during a 2 year Research Development Test & Evaluation (RDT&E) project for the AFSG office. Primary goals and objectives were to investigate how RFID could improve clinical and business processes within a Military Treatment Facility (MTF), create business cases with benefits and Return on Investment (ROI) for four applications, and validate with Proofs of Concept (POC). The selected applications: Medical Equipment Asset Tracking, Patient flow, Medication Administration Assistance, and Surgical Tray/Instrumentation Tracking.

Asset Tracking application tagged over 1600 assets, enterprise coverage over 550,000 square feet with in room level accuracy. Preventive maintenance improved over 33% for on time performance with reduction/elimination of Unable to Locate (UL) and Report of Survey (ROS). Average search time for tagged equipment was measured at an average of 2 minutes 21 seconds.

Surgical Instrument and Tray tracking was executed using a 2 dimensional bar code that was etched on over 6500 instruments. Tray count sheets were automated which allows scanning of each instrument during tray preparation providing 100% accuracy. Current tray tracking is with the use of bar codes, with the next phase will include the utilization of Autoclavable RFID tags.

Implementation Guidelines for these two applications will be addressed in addition to the research findings for Patient Flow and Medication Administration Assistance. Shipcom has received Authority to Operate (ATO) from Air Force Medical Service Agency for the Asset Tracking Solution. In-flight hypoxia events in tactical jet aviation: Characteristics and Symptoms

8. In-flight hypoxia events in tactical jet aviation: Characteristics and Symptoms
Uniformed Services University of the Health Sciences
LCDR Eric Deussing; Other Authors: A. R. Artino and R. V. Folga

INTRODUCTION: Hypoxia continues to be a significant threat in military aviation. To counter the hypoxia threat, military aviators receive periodic training using a low pressure chamber (LPC) or a reduced oxygen breathing device (ROBD). Results from previous research indicated the hypoxia symptoms reported by aviators trained on the LPC or ROBD are similar but not identical. These findings raised concern that the hypoxia symptoms experienced during training (LPC or ROBD) might also differ from those encountered during actual in-flight hypoxia events. This study explored the characteristics of in-flight hypoxia events among tactical jet aviators and compared the reported symptoms to those experienced by aviators during normobaric (ROBD) hypoxia training. METHOD: An anonymous survey was administered to U.S. Navy aviators prior to aviation physiology training. The survey queried participants about their previous encounters with in-flight hypoxia and the symptoms they experienced. RESULTS: Of the 566 aviators who completed the survey, 112 (20%) reported experiencing hypoxia symptoms in a tactical jet aircraft. Among these reports, 45 (40%) occurred in the F/A-18, 38 (34%) occurred in the EA-6B, and the remaining 29 (26%) occurred in other platforms. Altogether, the reported hypoxia incidents occurred at an average altitude of 25,064 ft mean sea level (SD = 8,433 ft), and 64 aviators (57%) indicated that they were not wearing the required oxygen mask when the incident first occurred. The three most commonly reported in-flight hypoxia symptoms were tingling (54%), difficulty concentrating (32%), and dizziness (30%). Chi-square analyses revealed differences between the symptoms encountered during actual in-flight mask-on events and those experienced during ROBD training. DISCUSSION: These results provide insight into the characteristics of
actual in-flight hypoxia events and suggest that in-flight hypoxia symptoms may differ from those experienced during hypoxia training.

9. Environmental Enrichment as a Neuroprotective Strategy
711 HPW/RHPA

Erica J. Doczy, Stuart W. Hoffman, James P. Herman, Catherine R. Harrison

Traumatic Brain Injury (TBI) is a major concern for the general and military population causing occupational disabilities and deficits in the areas of memory, social and executive function. This study evaluated a non-invasive, non-pharmaceutical technique of protection against these deficits through environmental enrichment (EE). EE increases cortical weight, neuronal density, dendritic branching, and angiogenesis. In a rodent model, EE is used successfully as a therapy following traumatic brain injury to reduce functional deficits in motor function, spatial memory, and learning. To examine the neuroprotective benefit of EE, adult male rats were placed in an enriched environment for 15 days. Enrichment was provided through social interaction, exercise, olfactory stimulation and new objects/toys to explore. Following enrichment (4 months of age), experimental and age-matched controls received a moderate medial prefrontal cortex injury via controlled cortical impact. After one week recovery, animals were behaviorally tested to assess memory, anxiety, and sensory neglect. Lesion-induced deficits in spatial memory (Morris water maze) were significantly attenuated in EE rats. In addition, sensory neglect was reduced in EE rats relative to non-enriched animals. No differences in anxiety-like behavior on the elevated plus maze were detected. These data suggest that the environmental enrichment is neuroprotective, resulting in improved recovery following injury. This data may ultimately be used to enhance an individual's resiliency to TBI.

Lung cancer is the most common cause of cancer-related death. Most lung cancer is the result of a preventable cause, smoking. Nevertheless, U.S. tobacco production remains the fourth highest globally. This study examined U.S. white male lung cancer mortality by State of residence and the associated risk factors of tobacco acreage, rural residence, smoking, poverty, lack of health insurance, and radon exposure. White male lung cancer mortality was significantly correlated with tobacco acreage ($r = .455$), rural residence ($r = .389$), and smoking ($r = .475$). Tobacco acreage ($P = .005$), rural residence ($P = .011$), and smoking ($P = .030$) remained significant with regression analysis. Tobacco-growing states (20 years prior), rural states, and states with higher adult smoking prevalence (13 years prior) were shown to have statistically higher lung cancer mortality among white males. The causes for this mostly preventable cause of death need further investigation in order to target effective public health interventions.

10. Investigating the Association of White Male Lung Cancer Mortality and State of Residence
82 AMDS/Sheppard

Maj Thomas Doker

Lung cancer is the most common cause of cancer-related death. Most lung cancer is the result of a preventable cause, smoking. Nevertheless, U.S. tobacco production remains the fourth highest globally. This study examined U.S. white male lung cancer mortality by State of residence and the associated risk factors of tobacco acreage, rural residence, smoking, poverty, lack of health insurance, and radon exposure. White male lung cancer mortality was significantly correlated with tobacco acreage ($r = .455$), rural residence ($r = .389$), and smoking ($r = .475$). Tobacco acreage ($P = .005$), rural residence ($P = .011$), and smoking ($P = .030$) remained significant with regression analysis. Tobacco-growing states (20 years prior), rural states, and states with higher adult smoking prevalence (13 years prior) were shown to have statistically higher lung cancer mortality among white males. The causes for this mostly preventable cause of death need further investigation in order to target effective public health interventions.

11. Utilizing the JBAIDS to Provide Synergistic Potential for the Identification of Food Borne Illnesses
USAFSAM/PHT1 and USAFSAM/PHD2; Brooks City-Base, TX

Elizabeth M. Escamilla1, MS, Mark W. Lehman, Maj, USAF, BSC, DVM, MS, MPH2, Linda S. Armstrong1, MS, Robert A. Alcorta, BS1, Clarise R. Starr, PhD1 and David L. Maserang, PhD1

INTRODUCTION: The High Molecular Load Kit (HMLK) offers a simple culture procedure to detect aerobic microorganisms in food within 24-48 hours with minimal investment in training and equipment. The HMLK is designed to detect the presence of most naturally occurring bacterial contaminant at high levels indicative of spoilage or intentional bacterial contamination that could result in potential acute disease. The purpose of this initiative was to combine the capabilities of the HMLK with the speed and specificity of real-time polymerase chain reaction (PCR) detection by utilizing the already fielded Joint Biological Agent Identification and
Diagnostic System (JBAIDS) instrument to test food for the presence of these contaminants. METHODS: Meals Ready-to-Eat, Individual (MREs) were spiked at high and low concentrations with four enteropathogens, Escherichia coli 0157:H7 (EHEC), Shigella, Salmonella, and Campylobacter, and evaluated using both the HMLK and the JBAIDS species-specific assays. RESULTS: EHEC was detected at high and low concentrations by both HMLK and JBAIDS assays. At low concentrations (~1-2 cfu/g), Shigella and Salmonella were not detected by HMLK but detected by JBAIDS. Campylobacter was not detected at high or low concentrations by the HMLK but was successfully detected by the JBAIDS assay. CONCLUSIONS: A synergistic relationship between JBAIDS and HMLK was seen and illustrated the advantage of running two different diagnostic techniques to increase the opportunity of detection. This strategy increases mission capabilities for both procedures, expanding the JBAIDS from a bioweapon response to a tool to investigate non-intentional bacterial food contamination events.

12. Gene modulation in human keratinocytes after exposure to different sizes of gold nanoparticles

711 Human Performance Wing (HPW)/RHPA

Garrett CM, Schrand AM, McDougal JN, and Hussain SM

The unique properties of gold nanoparticles (Au NPs) due to their small size, plasmonic nature, relative biocompatibility, and wide array of biological applications have revolutionized the field of nanobiotechnology. However, understanding the potential molecular effects after low dose nanoparticle exposure remains poorly understood. In order to assess the bio-effects of sub-toxic concentrations of gold nanoparticles (Au-NP) on human keratinocytes, whole-genome expression analysis was performed. Ingenuity Pathway Analysis determined 368 differentially expressed genes in Au NP treated cells that were members of intracellular networks corresponding to Canonical pathways of cell-mediated immune response, cellular development, organization, and maintenance, and stress response. Moreover, there are size-dependent differences in the gene expression profiles of these materials. The smallest particles tested (10nm) induced primarily up-regulation of genes involved in stress and inflammatory responses (S100A9, CD44, EPPK1), and signal transduction (RASAL2). In contrast, the largest particles tested (60nm) resulted mainly in the down regulation of genes involved in maintaining cell stability (DCN, SCAMP1), cell signaling (EPHA4) and cell trafficking (SCAMP1). The intracellular uptake of all of the different sized Au NPs was demonstrated via TEM and ultrahigh resolution light microscopy. In summary, the results demonstrate that size dependant uptake of Au NPs altered some of the key genes involved in inflammation, stress response and cellular development. Further work is needed to discern implications of gene alterations on protein expression in order to conclude functional effects of gold.

13. Screen-to-Detect Capability: Prototype Development

United States Air Force Academy (USAFA), Department of Biology

Harrison Gebs, Melanie Grogger, and Carlos J. Maldonado

INTRODUCTION: Currently, several Air Force MAJCOMs have a requirement for a screen-to-detect capability requirement against infectious disease agents and other pathogens of operational significance. The ideal platform will be a handheld/portable system, which can reliably screen samples for the presence of pathogens or other biological agents. This capability will afford a rapid (≤ 30 min) sample to answer turnaround time, from a variety of clinical and environmental matrices (sample types). The intended use of this platform is the efficient/reliable screening of both troops and equipment returning from deployed locations as well as those reporting to base from a routine operational tour in foreign countries. METHODS: In collaboration with Oak Ridge National Laboratory (ORNL) in Tennessee, the US Air Force Academy is using real time PCR system techniques as a standard in developing a working prototype capable of screening multiple
clinical samples for the presence of upper respiratory disease including but not limited to the H1N1 virus. The recent (July 2009) H1N1 outbreak at the academy showed that patients were ‘shedding’ infectious particles 24 hours before they presented febrile respiratory illness symptoms. Several preliminary trials were run for sample preparation and sensitivity/selectivity against pathogens of operational significance. SUMMARY: Once fielded, our biosensor platform will be able to minimize the negative operational impact infectious disease outbreak by successfully screening and identifying early potentially contagious (carriers) personnel before they present symptoms and infect other members in their unit.

United States Air Force School of Aerospace Medicine (USAFSAM)/ FEEH
John Kalns

PURPOSE: Heat and moisture exchangers (HME) are used for airway humidification in mechanically ventilated (MV) patients. Thus far, HMEs have only been evaluated under hospital conditions, although they are used during aeromedical evacuations (AE) to provide airway humidification for transported MV patients. Military AE are performed under extremely rugged conditions further complicated by the cold (~15ºC) and dry (~30% relative humidity) environment in military aircrafts, which may reduce the effectiveness of HMEs. This study evaluated 10 commercially available HMEs using a model test system that simulated AE conditions. METHODS: The fabricated HME testing system included a simulated patient model (warm chamber), a simulated aircraft model (cold chamber), ventilator, and a data acquisition system connected to a laptop computer. An HME testing region consisting of various connectors allowed for easy replacement of HMEs. Two sets of sensors flanked the HME testing position and continuously measured temperature and % relative humidity on the patient and ventilator sides of the HME. Absolute humidity (AH) outputs for the HMEs calculated using the measured temperatures and % relative humidity were compared. RESULTS: There were some notable differences in the performance of various HMEs both with regard to temperature and humidity on the patient side of the circuit. None of the HMEs tested were able to achieve American National Standards Institute (ANSI) recommended levels of AH value of ≥30 mg/L for MV patients but instead provided levels of ~20 mg/L. CONCLUSION: Passive HMEs may not provide adequate humidification of patient airway during AE missions.

15. HBO Effects on Disease Caused By Deployment Relevant Micro-organism
United States Air Force School of Aerospace Medicine (USAFSAM)/ FEEH
John Kalns

INTRODUCTION: A major concern for wounded soldiers is the threat of infection of the bone, or osteomyelitis. Ballistic projectiles cause trauma which may introduce bacteria into bones and surrounding tissue. Additionally, surgical procedures and orthopedic implants required to mend injured bones may increase exposure to bacterial pathogens. Osteomyelitis is difficult to treat with antibiotics alone and results in significant morbidity, complications, and increased hospitalization time. We hypothesized that a mouse model for implant-associated osteomyelitis can be used to evaluate the efficacy of hyperbaric oxygen therapy (HBOT) in the prevention and/or resolution of infections with deployment-related bacteria, including methicillin-resistant Staphylococcus aureus (MRSA), Pseudomonas aeruginosa, and Klebsiella pneumoniae. MATERIALS AND METHODS: MRSA, P. aeruginosa, and K. pneumoniae were isolated from wounded soldiers. Clinical isolates were grown in liquid cultures overnight and then used to coat stainless steel pins that were inserted into the tibias of C57BL/6 mice to produce chronic osteomyelitis infections. Mice received HBOT (100% oxygen at 2.4 ATA for 80 minutes) prophylactically for 5 days prior to infection followed by 12 or 19 days of HBOT; or mice received HBOT starting 5 days post-infection for 7 or 14 days. Bone lesion severity and bacterial burdens were compared between groups that received HBOT and controls groups that did not receive HBOT.
RESULTS: The rates of infection for MRSA, P. aeruginosa, and K. pneumoniae were 80%, 63%, and 34% and the median bacterial burdens were 9.2 \times 10^6, 5.7 \times 10^5, and 6.0 \times 10^5 colony forming units/gram of tibia, respectively. Lesion morphology differed between the bacteria: MRSA induced abscesses and severe lesions, P. aeruginosa induced moderate to severe lesions, and K. pneumoniae induced mild to moderate lesions.

SUMMARY: This model can be used to evaluate the efficacy of HBOT in a mouse model of implant-associated osteomyelitis with clinical isolates of MRSA, P. aeruginosa, and K. pneumoniae.

16. Analyzing the role of the major outer surface antigens in Burkholderia infection
Armed Forces Institute of Pathology

Hyung-Yong Kim

Burkholderia pseudomallei (BP) and B. mallei (BM) are closely related gram-negative, facultative anaerobic bacteria which cause life-threatening melioidosis in human and glanders in horse, respectively. In this study, 3 mouse monoclonal antibodies (BP7 10B11, BP7 2C6, and BP1 7F7) were developed into chimeric MAbs (cMAbs) against BP and/or BM. For the fast-performance production, we constructed 4 major different vector systems with a dihydrofolate reductase (DHFR) amplification marker, and optimized transfection/selection conditions in mammalian host cells with the single-gene and/or double-gene vector system. These 3 cMAbs stably produced by the DHFR double mutant Chinese hamster ovarian (CHO)-DG44 cells were affinity-purified. By ELISA and Western blot analysis using whole bacterial antigens treated by heat (65°C/90 min), sodium periodate, and proteinase K, the cMab BP7 10B11 (CK1) reacted with glycoproteins (34, 38, 48 kDa in BP; 28, 38, 48 kDa in BM). The cMab BP7 2C6 (CK2) recognized surface-capsule antigens with molecular sizes of 38 to 52 kDa, and 200 kDa in BM. CK2 was weakly reactive to 14–28, 200 kDa antigens in BP. The cMab BP1 7F7 (CK3) reacted with lipopolysaccharides (38–52 kDa in BP; 38–60 kDa in B. thailandensis). Western blot results with the outer membrane proteins of the 3 Burkholderia species were consistent with results with the whole Burkholderia cell antigens, suggesting that these immunodominant antigens reacting with the 3 cMAbs were primarily present on the membrane of the Burkholderia species. These 3 cMAbs would be useful for analyzing the role of the major outer surface antigens in Burkholderia infection.

17. Medical Flight Screening-Neuropsychiatry
Occupational Norms
United States Air Force School of Aerospace Medicine (USAFSAM)
LtCol Raymond E. King

Psychologists and other practitioners who assess individuals who have been thoroughly screened for entry into a competitive career field face a challenge. While their clinical training would led them to use normative values that are published in professional manuals, the individuals they are endeavoring to assess represent individuals at an extreme value in the normal distribution curve. For example, while intelligence tests are normal to have a mean of 100 and a standard deviation of 15, the average US Air Force (USAF) pilot has an I.Q. of 121. Moreover, the standard deviation for this group is 5.5, meaning that an USAF pilot with a measured IQ of 100 is clearly at the extreme left side of the occupational distribution. Therefore, in the absence of the ability to compare a pilot to his or her baseline functioning, it would be best to use occupationally derived norms and not those that are base on a cross section of the US population. Using data collected since 1993, psychologists at the USAF School of Aerospace Medicine are compiling a catalog of norms on clinical instruments, to include the Multidimensional Aptitude battery (MAB), the Personality Assessment Inventory (PAI), and the NEO Personality Inventory-Revised (NEO PI-R). Such a resource will enable base-level clinicians, to include both clinical psychologists and flight surgeons, to compared referred aviators to a relevant pool of occupationally similar individuals. Such a resource will more clearly define who is safe to return to flying duties and who requires additional assessment.
18. Diffusion Tensor Imaging In the Evaluation of Mild Military Blast Traumatic Brain Injury
59th Medical Wing (MDW)
Maj Jeffrey Lewis

Mild traumatic brain injury (mTBI) resulting from blast (e.g., improvised explosive device) exposure is poorly characterized. Twelve right handed active duty males with a history of mTBI and 12 age-matched healthy control participants (5 female) underwent diffusion tensor imaging (DTI) on a Siemens 3T MRI scanner. Voxelwise statistical analyses of white matter (WM) fractional anisotropy (FA) images were conducted to compare groups and perform within-mTBI group regression of Trails B performance, persistent errors on the Wisconsin Card Sorting Test (PE-WCST), and time since injury. Examining the confluence of results (nonparametric p-value = 0.01; > 20 voxel spatial extent) across analyses, the right forceps of the corpus callosum of mTBI patients had significantly reduced WM FA values that were negatively associated with PE-WCST (i.e., lower FA associated with worse performance). Likewise, the left superior longitudinal fasciculus of mTBI participants had reduced WM FA values that were negatively associated with time since injury (e.g., lower FA values with longer time post-injury). These exploratory analyses suggest that DTI is sensitive to alteration in white matter microstructure after blast mTBI and changes may relate to degree of cognitive dysfunction after injury.

19. Use of Staple-Line Bio-reinforcement in a Pig Model (Sus scrofa domestica) Gastrointestinal Anastomosis: Histological Incorporation and Alteration of Tensile Strength
81 MDG Clinical Research Laboratory
Capt Mark Lytle

Small bowel anastomotic leak and bleeding are potentially catastrophic complications after small bowel resection and anastomosis. Prior studies have shown to increase circumferential burst pressure by buttressing the anastomotic staple line. However, the questions of how staple line reinforcement agents affect staple line tensile strength or how they affect the intestine at a cellular level are still unclear. A pig model was used to create small bowel anastomoses using bioreinforcing agents with varying degrees of absorbability. These were then tested for tensile strength and examined under light and scanning electron microscopy. These techniques allow us to evaluate inflammatory changes, tensile strength, and tissue incorporation and remodeling that occurs with the use of bioreinforcing agents with small bowel anastomoses.

20. The Advanced Diagnostic Laboratory: Translational Research for the Warfighter
Eagle Applied Sciences
Dr. Jon McDonald

The mission of the Advanced Diagnostic Laboratory (ADL) is to test and develop emerging technologies for diagnostics and surveillance in order to transform medical capability to enhance prevention and control. The ADL tests the sensitivity and specificity of molecular assays for identification of pathogens of military significance. This is accomplished by monitoring military trainees at Lackland Air Force Base that have febrile respiratory illness through IRB-approved protocols. In addition to infectious diseases, the scope of the ADL includes chronic diseases that plague the military retiree and dependent populations. In its initial genetic testing study, the ADL is recruiting individuals treated at Wilford Hall Medical Center with type 2 diabetes mellitus (T2D). Although preventive measures can be implemented to reduce T2D onset, irregular work schedules, tours of duty in remote locations, and continuous changes in environment impose additional challenges that many military personnel face in maintaining healthy lifestyles. The consequences for T2D in the military setting include increased training costs due to medical discharge, and decreased skill-sets, knowledge, and experience within the military overall. The objective of the current study is to evaluate the prevalence of risk-associated genetic factors in T2D-patients as compared to nondiabetic controls. These data will be utilized to assess risk-conferring
genotypes in the young, healthy active-duty population to estimate the prevalence of risk-associated factors in our current and future war fighters. Identifying individuals at risk may ultimately delay onset through healthy lifestyle modifications and disease management programs.

21. Electrocardiographic changes in a model of critically ill cyanide toxicity
59th MDW Wilford Hall Medical Center (WHMC)

Dr. Vik Beharta, Dr. Tylan Muncy

BACKGROUND: Cyanide is a commonly used terrorism weapon and is product of combustion in structural and vehicle fires in garrison. Previous rudimentary measurements have focused on a lactic acidosis. We have recently described hypotension and cardiovascular hemodynamics resulting from cyanide toxicity. OBJECTIVE: To evaluate the electrocardiographic (ECG) measurements, invasive brain tissue microdialysis metabolites, and noninvasive brain near infrared spectrometry (NIRS) as novel or bedside measurements of cyanide toxicity. METHODS: 24 swine were intubated and instrumented. A continuous cyanide infusion was started, until the development of severe hypotension (50% of baseline MAP). Animals were randomly assigned to intravenous or intraosseous hydroxocobalamin and monitored for 60 minutes after the start of antidotal infusion. Group size analysis based on a power of 80% yielded a sample size of 12 animals per group for comparison. RESULTS: We have interim analysis data. 1 animal in each arm died thus far. ECG findings were significant and showed ST depression and interval width changes. NIRS shows a significant declined during cyanide infusion and rise with antidote administration. Microdialysis collection is still in preparation. Samples has been collected but not completed. Preliminary animals showed a rise in brain acidosis. The animals developed hypotension, lactate acidosis, and recovery similarly to our previous models. CONCLUSION: We are evaluating novel and noninvasive measurements of cyanide toxicity. These measurements may be able to detect cyanide toxicity at the bedside rather than cyanide levels which cannot be routinely. In addition, these measurements may be able to prognosticate cyanide toxicity better than current methods.

22. Development of SAM based DNA biosensors for the detection of the hippuricase gene of Campylobacter jejuni using optical and electrochemical methods
81 MDG Clinical Research Laboratory

Maj Eric Olsen

Campylobacter jejuni is a significant cause of human bacterial gastroenteritis, Guillain-Barre syndrome, and reactive arthritis and Reiter syndrome. Detection using extraction methods, followed by serotype or genotype based diagnostic assays take up to 96 hours. Polymerase Chain Reaction (PCR) is very selective but is less sensitive, while electrochemical DNA microarrays produce high background signals. Fluorophore based sensing systems suffer from photo-bleaching. Additionally, the sensing platform is destroyed after each measurement. Reusability, reliability and robustness of the surface structures make Self-Assembled Monolayer (SAM) and hybridization based make optical sensing a better choice. Covalent linkages are employed to develop anti-fouling biosensor surface, often via thiol-gold linkages or avidin-biotin chemistries. We report the use of biotinylated and thiolated ssDNA probes to develop Diffraction Optics Technology (DOT) and SPREETA sensing platforms. Conformation changes and DNA hybridization on the surface is also monitored using Electrochemical Impedance Spectroscopy (EIS). Surface blocking effects are exerted by charged state of the probe that is immobilized on gold and also from the hybridization of target ssDNA with the probe. The key to improved efficiency in DNA hybridization is to develop an optimum surface density and chemistry minimizing non-specificity and increasing sensitivity. Mixed self-assembled monolayers (SAM) obtained from thiolated DNA and blocking thiols increases efficiency. DOT sensors had a detection limit of 5 nM while SPR sensors had a detection limit of 2.5 nM DNA with negligible change in SPR sensor sensitivity (~9.7 x 10^-7 ΔRU).
23. Thoracic ultrasound can predict pneumothorax size in a cadaver model
59 EMDS
Capt Christopher Pitotti

OBJECTIVES: Thoracic ultrasound (TUS) is a fast and accurate way to diagnose a pneumothorax (PTX) in patients with thoracic trauma. METHODS: We instilled air into the extra-pleural space of 10 cadavers in 5% increments as calculated by chest CT, up to 50%. The presence of lung sliding was assessed at 11 locations and CT repeated after each insufflation. The mean and range of PTX size as detected by TUS was determined. Each anatomic location was correlated to the presence or absence of lung sliding to predict the best location to discriminate a PTX size of greater or less than 20% using a regression analysis. RESULTS: Induced PTX size ranged from 2 to 71%. On the right a PTX was first detected at the anterior axillary line at a mean PTX size of 13.7% (13.5% left); 35.9% at the mid axillary line (38.6% left); and 55.8% at the posterior axillary line (56.7% left). The presence or absence of lung sliding in the 6th intercostal space of the anterior axillary line was the best anatomic location to predict a PTX of greater or less than 20% on the right chest (r=0.88, p<0.01) and on the left an r2 of 0.88. Pleural fluid volume determination on the right can be determined by the following equation, Vol (liters) =8.3 x distance from chest wall to lung lining (cm) – 0.02; and on the left, Vol (liters) = 5.6 x distance from chest wall to lung lining (cm) + 0.76. CONCLUSION: Ultrasound may be used to define pleural effusion size in a cadaver model.

24. Estimating hemothorax volume in cadaver model
59 EMDS
Capt Christopher Pitotti

OBJECTIVES: Emergency ultrasound is a fast and accurate way to diagnose a pleural effusion or hemothorax. An ultrasonographic method of determining effusion size has not been validated. Our objective was to determine if ultrasound could estimate pleural effusion size in a cadaver model. METHODS: We placed a supraclavicular catheter into each hemithorax of 8 intubated cadavers. A baseline CT was performed to determine initial pleural effusion size. An ultrasound exam was performed at the posterior axillary line in the 4th intercostal in the supine position. Measurement of extent of effusion from the chest wall to the visceral pleura was recorded after each subsequent instillation of 50 ml of normal saline up to 500 ml of instilled saline. A regression analysis was performed to determine a model to best correlate effusion size and this linear dimension. RESULTS: Pleural effusion size ranged from 0 to 1019 mL on the left and 0 to 922 mL on the right. Data for one cadaver on the right was excluded as an outlier. The linear regression model on the right had an r2 of 0.92 and on the left an r2 of 0.88. Pleural fluid volume determination on the right can be determined by the following equation, Vol (liters) =8.3 x distance from chest wall to lung lining (cm) – 0.02; and on the left, Vol (liters) = 5.6 x distance from chest wall to lung lining (cm) + 0.76. CONCLUSION: Ultrasound may be used to define pleural effusion size in a cadaver model.

25. A New Survivable Damage Control Model of Hypothermia, Hemodilution, and Liver Injury
86th MDS (AF member)
Maj/Dr. Bradley Putty

Intra-abdominal hemorrhage is a major cause of preventable mortality, and the liver is the most commonly injured solid organ. The mortality for high grade liver injuries can exceed 50%, with early deaths attributable to failure to control hemorrhage, frequently complicated by acidosis, hypothermia and coagulopathy. There is a need to effectively evaluate treatment durability and associated complications in high grade liver injuries. Twenty Yorkshire swine underwent carotid and jugular cannulation for 35% blood volume reduction. A laparotomy was performed and core body temperature lowered to <35 °C. Ten animals underwent non-surgical liver injury, and ten underwent standardized AAST grade IV surgical injury. Shed blood was collected at 2 and 15 minutes, with packing at 2 minutes in the surgical injury. The abdomen was closed, and the animal was sacrificed at 48 hours. Serology
was performed at baseline, before and after liver injury, and thromboelastography (TEG) at baseline and post injury. The model demonstrated decrease in MAP from 86.2 +/- 7.9 to 60.2 +/- 12.5 mmHg (p=0.001), decrease in temperature from 36.7 +/- .7 °C to 34.6 +/- .7 °C (p<0.0001), and survival of 70%. There were significant decreases in hemoglobin, platelets, and base excess with increases in lactate and anion gap levels. Both non-surgical and surgical injuries caused significant volumes of additional blood loss with 20% decreases in MAP following the surgical injury. TEG demonstrated a significant acceleration of initial clot formation and rapidity with similar clot strengths.

A swine survival model of lethal traumatic liver injury was successfully developed.

26. The Association of Binge and Heavy Drinking Patterns to Military Readiness United States Air Force School of Aerospace Medicine (USAFSAM)

Maj Raymond Clydesdale

The negative outcomes from alcohol misuse have been chronicled for decades in epidemiological studies. Recent research has focused on patterns of drinking. Binge and heavy drinking have been associated with multiple negative outcomes, to include surrogate outcomes designed to measure decrements to military readiness. This study is perhaps the first to examine whether binge or heavy drinking patterns are associated with the U.S. military's overall inability to deploy or the individual reasons unable to deploy.

The prevalence of binge and heavy drinking and the inability to deploy rates were assessed from responses to the 2005 Department of Defense Survey of Health Related Behaviors Among Military Personnel. A secondary analysis of extant data resulted in a final sample size of 13,619 respondents who represented 847,253 active-duty military personnel. Multivariate models were fitted to examine the association between patterns of drinking and individual reasons for the inability to deploy.

Logistic regression showed no association of binge or heavy drinking to greater inability to deploy. Interestingly, individual reasons for the inability to deploy did show an association to include: Training, Dental Issue, No HIV Test, and Family Situation. There was no association noted for the individual reasons: Injury, Illness, Leave/Temporary Duty, or Other. Binge and heavy drinkers appear to be more susceptible to the psychosocial determinants as reasons for the inability to deploy.

27. Deployment Stressors and Job Performance: A Pilot Study

United States Air Force (SUAF), Nurse Corps

LtCol Cherri Shireman

PURPOSE/AIMS: The purpose of this focused ethnographic pilot study was to describe the deployers’ perceptions of performing his duties/job while in garrison versus a war zone/deployed location to provide insight into the occupational stressors associated with military deployment. BACKGROUND: The stressors of military deployment have been linked to the deployment related illnesses reported by veterans of the Persian Gulf War, and OPERATIONS ENDURING AND IRAQI FREEDOM. Researchers have completed large numbers of studies investigating a possible link between military deployment stressors and adverse health outcomes. The focuses of these studies were on the health outcomes post deployment and not the actual deployment stressors associated with performing one’s assigned duties. DESIGN: Salazar and Beaton’s ecological model of occupational stress guided this exploratory ethnographic study. The research and interview questions were based upon the literature and the sensitizing framework. Research questions included the following: 1. What are the deployers’ perceptions of the differences in performing their duties in garrison versus a war zone location? 2. What are the deployers’ perceptions of the stressors in the war zone environment that alter or change the manner in which he or she performs their duties? DATA COLLECTION: Since active duty and former military members views may differ, only former military were recruited. Snowball sampling was used to recruit participants. Semi-structured face-to-face digitally recorded interviews, demographic questionnaires, and field notes were utilized to
collect data. The interviews were transcribed verbatim. DATA ANALYSIS: Emergent coding was utilized to identify and define coding categories from the transcribed interviews. Data were analyzed using content analysis and constant comparison. Ethnograph, v6.0, a data analysis software program, was utilized to organize data and assist with separating data into similar clusters for analysis. FINDINGS: The convenience sample included three male retired USAF enlisted members: 48-year-old aircraft electronic warfare technician, 42-year-old aeromedical craftsman, and 45-year-old utilities system superintendent. Participants had an average of 22.5 years of military service and at the time of the interview had been retired from military service for approximately 2.3 years. All three participants had deployed an average of three times and each of them had deployed in support of OPERATIONS IRAQI FREEDOM (OIF). Two of the three participants had deployed to forward areas/war zones. Four key themes that emerged from the data were doing the job, taking care, preparation strategies, and family impact. All participants stated that they were well trained to perform their job both in garrison and in a war zone. The differences between job performance in garrison and the war zone included the physical environment, mission, and work hours. Each participant acknowledged easily adapting to these differences. Taking care of their families, airmen, and lastly themselves was another prevailing theme reported by all participants. The most significant stressor reported by all, was time away from family, which resulted in missed family events and lost time that could never be recovered. All participants saw deployment as part of the job, and discussed specific ways in which they prepared themselves and their families for deployment. CONCLUSIONS: Retired senior enlisted military members with over 22 years of service identified time away from family as the most significant stressor of deployment. They reported easily and quickly adapting to the deployed work environment, and denied any impact on their job performance. Limitations include the small sample size of only males with many years of military experience. RECOMMENDATIONS: Further research is needed to explore the stress of deployment induced family separations, including the influence of previous deployments and years of military service. The results of this pilot study will be utilized to determine the content and structure for a larger qualitative study involving active duty USAF personnel. MILITARY NURSING RELEVANCE: Stressors of deployment may adversely affect the military members’ health, influencing his or her ability to complete the mission. As military nurses work to ensure a healthy and fit force, it is essential that they have a better understanding of deployment related stressors. Today, as the U.S. government continues to maintain a high military operations tempo, the results of this pilot study and future research will be essential to military nursing, as the knowledge gained will help to identify mechanisms to prevent, modify, and minimize the negative health effects of deployment.

28. Evidence based combat casualty care: a case illustration of the GWOT vascular initiative research program
UK research fellow working with 59 MDW/SSSOGV

BACKGROUND: Evidence based care in wartime requires a military-unique research program, the product of which must translate to lessen death and disability. The Global War on Terror Vascular Initiative (GWOTVI) is designed to channel questions encountered during vascular injury management to pathways for study. While validation rests in peer-reviewed publications and practice guidelines, real-time scenarios also provide substantiation. The objective of this report is to provide an account of vascular injury, examining the spectrum of care for the bearing of current research direction. METHODS: An individual case analysis of vascular injury from Operation Enduring Freedom (OEF) examining each level of care for directed surgical and adjunctive interventions. CASE DESCRIPTION: On 12 January 2010 a US Marine sustained popliteal artery injuries rendering both legs ischemic. At Camp Bastion (level IIE) flow was restored with temporary vascular shunts and fasciotomies.
performed within 1 hour. The limbs were perfuse during MEDEVAC to Bagram Air Field (level III) where shunts were removed and repair performed using autologous vein. The negative pressure wound therapy (VAC™) adjunct was applied to the leg wounds. AIREVAC to CONUS (level V) was successful where limbs were viable and the Marine entered into GWOT VI for quality of life and limb survey.

CONCLUSION: This account validates current posture of the GWOT VI program. All facets of care including international collaboration, early restoration of flow with vascular shunts, fasciotomy, definitive repair with vein, use of VAC™ and patient-based outcomes are areas of focus within the current research plan.


United States Air Force School of Aerospace Medicine (USAFSAM)/PHT, Brooks City-Base, TX
Clarise R. Starr, PhD, George F. Viale, MSgt, USAF, Linda S. Armstrong, MS, Elia Villazana-Espinoza, MS, Robert A. Alcorta, BS, Luis Perez, MS, and David L. Maserang, PhD.

INTRODUCTION: The JBAIDS real-time PCR assays utilize manual extraction to process many different types of matrices for RT-PCR detection. The Q-Flow detection kit that is currently used requires many processing steps and takes about 2.5 hours to extract 12 samples. A new kit, called the Platinum Path, has been introduced that takes about 1 hour to extract eight samples. Akonni Biosystems has developed an all-inclusive one-step pipette tip that can purify a sample in as little as 4 minutes without labor-intensive processes or hazardous organic extractions. The purpose of this effort was to compare the three different extraction procedures and their ability to successfully detect targets on the JBAIDS. METHODS: The Q-Flow 1-2-3, Platinum Path, and Akonni TruTip were used to extract high and low concentrations of B. globigii spores, E. herbicola, and MS2 spiked in various clinical, food, and environmental matrices. All protocols were performed according to package inserts, and extracts were tested on the JBAIDS using respective dry-down assays. RESULTS: Q-Flow performed the best, consistently having the lowest crossing point value on JBAIDS assays, except when tested on a 10% soil solution. TruTip performed as well as the Q-Flow in many conditions and, overall, was better than the Platinum Path in almost all conditions tested. Overall, Platinum Path performed the most inconsistently, especially when trying to detect a viral target. CONCLUSIONS: Our findings suggest that the use of the Akonni TruTip may be a viable option for a quicker manual extraction, saving time and money.

30. Evaluation of Rapid Point-of-Care (POC) Kits for Influenza A/B

United States Air Force School of Aerospace Medicine (USAFSAM)/PHT, Brooks City-Base, TX
Clarise R. Starr, PhD, Elizabeth M. Escamilla, MS, Rahdika Brown, SSgt, USAF, Roel F. Escobar, BS, Linda S. Armstrong, MS, Manuel Y. Caballero, BS, Elia Villazana-Espinoza, MS, and David L. Maserang, PhD.

INTRODUCTION: The ability to rapidly and correctly diagnose influenza has proven challenging over the years due to the mutation frequency of the target virus and the many upper respiratory viruses that produce “flu-like” symptoms. There are many rapid influenza kits on the market that are configured for point-of-care (POC) testing, many variations of which are utilized by the USAF. The purpose of this effort was to evaluate the performance of these POC kits. METHODS: Five commercially available kits (BinaxNOW Influenza A&B, Remel X/pect Flu A&B, BD Directigen EZ Flu A+B, Quidel QuickVue Influenza Test, and 3M Rapid Detection Flu A+B Test) were tested against influenza A and B and negative patient samples. In addition, isolates were tested during the April 2009 outbreak to assess the robustness in detection of novel H1N1 strains. RESULTS: The POC kits were able to detect 34-60% of the influenza A positive samples, with a specificity range of from 15%-100%. Positive predictive value (PPV) and negative predictive value (NPV) of these kits were 58%-100% and 6% to
66%, respectively. The POC kits were able to detect 8-63% of the influenza B positive samples and had 14%-100% specificity. The PPV and NPV ranges were 29%-96% and 7%-78%, respectively. The five kits tested were unable to detect 3 of the 28 H1N1 culture strains tested.

CONCLUSIONS: The negative predictive value of POC kits was quite low. Samples determined negative by a POC should be sent to a laboratory for confirmatory testing, based on the clinician’s impressions.

31. Genomic Characterization of Human Adenovirus 36, a Putative Obesity Agent
CIF, 60MDG, Travis AFB, CA
MSgt Sarah Torres

Increased levels of serum antibody titers against Human adenovirus 36 (HAdV-D36) are associated with human obesity and experimental obesity in laboratory animals. While HAdV-D36 has been studied as an infectious agent implicated in obesity for over a decade, the complete genome sequence and its analysis have yet to be reported. A detailed analysis of the genome sequence of HAdV-D36 may be important to understand its role in obesity. Genomic and bioinformatic comparisons with other HAdVs identified differences that suggested unique functions. Global pair wise genome alignment with all sequenced Human adenovirus D (HAdV-D) genomes revealed areas of non-conserved sequences in the hexon, CR1(beta), CR1(gamma), and fiber genes. Phylogenetic analysis of all HAdV-D36 proteins confirmed that this virus belongs to species Human adenovirus D. HAdV-D36p stock was acquired and subsequently amplified in monolayers of A549 cells in 75 cm2 flasks for intracellular viral DNA extraction. Primers were designed based on conserved adenovirus sequences of types in HAdV-D and amplicons positive for the correct size were sequenced on an Applied Biosystems 3130x Genetic analyzer. The proteins and genes of HAdV-D36 were compared to homologs in other HAdV-D genomes. Percent identities between proteins of HAdV-D36 and other HAdVs were determined using Fasta3 [EBI] and Blastp software. This genomic analysis of HAdV-D36 provides an important tool for comprehending the role that this unique adenovirus may play in human obesity. Low amino acid sequence identity in the CR1 (beta) and CR1 (gamma) genes may suggest distinctive roles for these proteins. Furthermore, the predicted molecular models of the HAdV-D36 fiber protein seem to implicate a unique tissue tropism for HAdV-D36.

32. Rapid Detection of Novel H1N1 Influenza Virus by Real-Time RT PCR
CIF, 60MDG, Travis AFB, CA
MSgt Sarah Torres

The first case of influenza A H1N1 infection in the United States was reported by the Naval Health Research Center in mid-April 2009. Today, the new H1N1 virus has spread to over 160 countries. Thus, it is important to acquire reliable epidemiological data on the spread of this pandemic virus. To address this problem, we developed a real-time RT-PCR assay that detects a 122 base pair sequence in the haemagglutinin (HA) gene and a 131 base pair sequence in the neuraminidase (NA) gene. One hundred and twenty oropharyngeal swab specimens from the Naval Health Research Center, San Diego, CA were used to validate the new assay. The described assay detected nine of 30 confirmed H1N1 positive clinical isolates from respiratory disease outbreaks. The real-time RT-PCR assay had a wide dynamic range, detecting from 10⁴ to 10⁷ copies of genomic RNA per reaction. The assay did not cross-react with other influenza viruses, adenoviruses, respiratory syncytial virus, or common respiratory tract bacteria. The described assay is easy to use, sensitive and specific for the H1N1 assay in clinical throat swab specimens, and very rapid since turnaround time is less than two hours to obtain an answer.

33. Thawing of plasma which could be used in austere pre-hospital settings
59 MSGS
Capt Leslie Vojta

Trauma patients are at high risk for coagulopathy. Current doctrine calls for transfusing plasma as part of the initial resuscitation in addition to packed red cells. The
gold standard for thawing plasma is 15 minutes in the blood bank and 40 minutes for deployed Forward Surgical Teams. Medical providers have improvised many ways to thaw plasma en route to pick up casualties, including placing it inside body armor.

We obtained fresh frozen plasma (FFP) from the hospital blood bank and thawed it using a novel warming device. The first device was a commercially available Hypothermia Prevention & Management Kit (HPMK) which is available in the combat theater. It incorporates self-heating pads inside a nonconductive reflective layer. It is used to warm patients during transport. We placed the FFP inside the HPMK. The second device was a sleeve made from foil-lined insulating material also using self-heating pads. We monitored time to thaw FFP and used an emergency nurse to confirm that it could be transfused.

The HPMK did not thaw the FFP to solution within 3 hours, but it had become a slushy. The novel device took 90 minutes to thaw to transfusability. The control (ambient air) remained frozen.

The novel device provided adequate thawing of plasma which could be used in austere pre-hospital settings. It does not surpass hospital grade water baths that can thaw FFP in 15 minutes.

34. Local tissue effects of topical hemostatic agents in a swine survival model of hepatic injury
CIF, 60MDG, Travis AFB, CA
Capt Geoffrey Douglas

INTRODUCTION: Hemostasis of liver injuries can be achieved with the use of topical agents and surgeons can choose from numerous absorbable or non-absorbable materials. In this study we compared the short term histological effects of various hemostatic agents in a swine model of nonlethal hepatic injury. METHODS: Nine swine were anesthetized and prepared for surgery using standard methods. A small midline laparotomy incision was used to expose the liver, and ten 1.4cm punch biopsies were made on the diaphragmatic surface. Each biopsy site was randomly assigned to receive one of ten hemostatic agents. These included: chitosan, Combat Gauze TM, regular gauze, Stasilon®, Surgicel™ (to be removed 2 days later), Surgicel™ (to be left in place), WoundStatTM, Avitene, thrombin soaked gel foam or electrocautery. RESULTS: Bleeding from the liver biopsy sites was usually controlled by a single application of each agent. When liver packing and hemostatic agents were removed at 48 hours, there was little re-bleeding, which was usually controlled by application of spray thrombin. Histologic analysis indicated that hemorrhage, necrosis and clotting were more pronounced in the earlier time points. All agents induced similar amounts of fibrosis and inflammatory changes that increased with time. The absorbable hemostatic agents were more likely to form abscesses and were associated with more debris and granulomatous changes than those that required removal. WoundStat caused severe tissue necrosis but was associated with less hemorrhage and clotting than other agents. Electrocautery produced severe initial necrosis, but was comparable to other agents by two weeks.

35. Evaluation of A Kaolin Impregnated Hemostatic Dressing (Combat Gauze™) In A Large Animal Model (Sus scrofa) Of Severe Hepatic Injury
CIF, 60MDG, Travis AFB, CA
Capt Geoffrey Douglas

INTRODUCTION: In the most severe liver injuries, hypothermia and coagulopathy coexist and are highly lethal. Management frequently involves the use of topical hemostatic agents combined with perihepatic packing. Kaolin-impregnated gauze or Combat GauzeTM (CG) is a new hemostatic dressing that has demonstrated significant potential for hemorrhage control in external wounds. The objective of this study was to determine the efficacy of CG in controlling severe hemorrhage in hypothermic, coagulopathic swine with severe hepatic injury. METHODS: Anesthetized animals underwent splenectomy and were cooled to 32°C while undergoing a 60% volume per volume exchange transfusion using Hextend. A Grade V liver injury was created in the right middle hepatic
lobe. All animals were allowed to freely bleed for 30 seconds, then randomized to treatment with CG or standard laparotomy pads to the injury site. RESULTS: There was no difference between groups in preinjury parameters. Animals packed with CG demonstrated significantly less blood loss when compared to standard laparotomy packing (control=41.6ml/kg, treatment=23.9ml/kg, p=0.05). There was a trend towards lower resuscitation requirements in the CG group (control=31.3ml/kg, treatment=4.7ml/kg, p=0.06) and no statistically significant difference in mortality (control =43%, treatment=14%, p=0.24). Histology of the injury sites showed more adherent clot in the CG group, but no obvious tissue destruction. CONCLUSION: In severe hepatic injury Combat GauzeTM reduced blood loss and improved resuscitation when compared with standard gauze, apparently without tissue damage. We conclude that Combat Gauze™ may be safe and effective for internal use.

36. The Effect of Negative Pressure Wound Therapy on Eluted Antibiotic Concentrations from Antibiotic Impregnated Polymethylmethacrylate Beads Implanted in a Simulated Porcine Open Femur Fracture Model
CIF, 60MDG, Travis AFB, CA
Capt Geoffrey Douglas

INTRODUCTION: Antibiotic impregnated polymethylmethacrylate (PMMA) beads and negative pressure wound therapy are frequently used to treat open fractures that are at risk of infection. Data on their use in conjunction with each other is minimal. The effect of negative pressure wound therapy on the decay rate of local wound antibiotic concentrations has not been defined. The objective of the study is to evaluate the effect of negative pressure wound therapy on the concentration of vancomycin and tobramycin in the tissue fluid surrounding simulated femur fractures in a porcine model. METHODS: Under general anesthesia 10 X 4mm corticotomies were made midshaft on the lateral aspects of both femurs. Equal volumes of polymethylmethacrylate beads containing vancomycin and tobramycin were placed around the corticotomy. In each pig, one wound was closed in layers; the opposite wound was treated with negative pressure wound therapy with the sponge placed either in direct contact with the beads or superficial to reapproximated fascia lata. The antibiotic concentration in the wound fluid was measured every 12 hours for 72 hours. RESULTS: There were 20 animals tested with 10 in each group. The rate of decay of antibiotic was similar in each group. At 72 hours the tobramycin level was consistently above the typical minimum inhibitory concentrations (MIC) in both groups (control=25.32 μg/ml, closed fascia = 20.38 μg/ml, open fascia=25.21 μg/mL; p>0.05). We conclude that negative pressure wound therapy used in conjunction with antibiotic impregnated PMMA beads will not adversely affect drug concentrations in wounds.
Appendices
Appendix A.
AFMS Medical Research Symposium Agenda
# AFMS Medical Research Symposium Agenda

**TUESDAY, August 24, 2010**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session/Track</th>
<th>Presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:30 am – 8:30 am</td>
<td>Registration (Crystal Ballroom Foyer)</td>
<td></td>
</tr>
<tr>
<td>8:30 am – 8:45 am</td>
<td>Plenary Session (Salon A/B)</td>
<td>SGRS Welcome: Col Don White, Director, Research and Development</td>
</tr>
<tr>
<td>8:45 am - 9:15 am</td>
<td>Plenary Session (Salon A/B)</td>
<td>SGR Welcome: Brig Gen James Carroll, Commander, Air Force Medical Support Agency</td>
</tr>
<tr>
<td>9:15 am - 9:45 am</td>
<td>Plenary Session (Salon A/B)</td>
<td>Deputy Assistant Secretary of Defense for Force Health Protection &amp; Readiness: Dr. Peach Taylor</td>
</tr>
<tr>
<td>9:45 am - 10:00 am</td>
<td>Plenary Session (Salon A/B)</td>
<td>Break (Salon C)</td>
</tr>
<tr>
<td>10:00 am - 10:30 am</td>
<td>Plenary Session (Salon A/B)</td>
<td>Defense Medical Research and Development Program (DMRDP)</td>
</tr>
<tr>
<td>10:30 am - 11:15 am</td>
<td>Plenary Session (Salon A/B)</td>
<td>COL Dallas Hack, Director, US Army Combat Casualty Care Research Program</td>
</tr>
<tr>
<td>11:15 am - 11:30 am</td>
<td>Plenary Session (Salon A/B)</td>
<td>Armed Forces Institute of Regenerative Medicine (AFIRM): LTC Brian Moore, Program Manager</td>
</tr>
<tr>
<td>11:30 am - 1:00 pm</td>
<td>Lunch Break</td>
<td>Defense Technical Information Center (DTIC): Ms. Shari Pitts, Information Collection Division</td>
</tr>
<tr>
<td>1:00 pm - 1:30 pm</td>
<td>Operational and Medical Track (Salon A)</td>
<td>Attenuation of Altitude De-acclimatization/ Neocytolysis with Exercise Intervention (Lt Col Michael Brothers)</td>
</tr>
<tr>
<td>1:00 pm - 1:30 pm</td>
<td>Enroute Care Track (Wilson/Harrison)</td>
<td>Optimal User Interface for Remote En-Route Care Patient Monitoring (Dr. Richard Bucholz)</td>
</tr>
<tr>
<td>1:00 pm - 1:30 pm</td>
<td>Force Health Protection Track (Salon B)</td>
<td>A Novel Approach to Zoonotic Population Health Monitoring: The Zoonoses Integration Project (Maj Thomas Doker)</td>
</tr>
<tr>
<td>1:00 pm - 1:30 pm</td>
<td>Nursing Track (Jackson)</td>
<td>Secondary Insults of Traumatic Brain Injury in CCATT Patients Returning from Iraq/Afghanistan (Maj Susan Dukes)</td>
</tr>
<tr>
<td>1:30 pm - 2:00 pm</td>
<td>Operational and Medical Track (Salon A)</td>
<td>Impact of Alternating Days of Intermittent Hypoxic Exposure (IHE) on Physical and Cognitive Performance (Lt Col Michael Zupan)</td>
</tr>
<tr>
<td>1:30 pm - 2:00 pm</td>
<td>Enroute Care Track (Wilson/Harrison)</td>
<td>Vascular Injury Rates from the Wars in Iraq and Afghanistan (Lt Col Todd Rasmussen)</td>
</tr>
<tr>
<td>1:30 pm - 2:00 pm</td>
<td>Force Health Protection Track (Salon B)</td>
<td>Hydroxocobalamin and Epinephrine Each Improve Survival in a Novel Swine Model of Cyanide-Induced Cardiac Arrest: A Randomized Trial (Maj Vik Bebarta)</td>
</tr>
<tr>
<td>1:30 pm - 2:00 pm</td>
<td>Nursing Track (Jackson)</td>
<td>Iron Status of Deployed Military Members (Maj Candy Wilson)</td>
</tr>
<tr>
<td>2:00 pm - 2:30 pm</td>
<td>Operational and Medical Track (Salon A)</td>
<td>Altitude-related Differences in Running Economy among Sea Level Residents during 46 Weeks at Moderate Altitude (Dr. Jeff Nelson)</td>
</tr>
<tr>
<td>2:00 pm - 2:30 pm</td>
<td>Enroute Care Track (Wilson/Harrison)</td>
<td>Direct Vascular Control Results in Less Physiologic Derangements than Aortic Crossclamping in a Porcine Model (Capt Nick Markov)</td>
</tr>
<tr>
<td>2:00 pm - 2:30 pm</td>
<td>Force Health Protection Track (Salon B)</td>
<td>Cold Injury in Military Population: Current Trends and Comparison to Past Conflicts with Current Research (Capt Andrew Hall)</td>
</tr>
<tr>
<td>2:00 pm - 2:30 pm</td>
<td>Nursing Track (Jackson)</td>
<td>Air Force Nurse Transition Program (Col Robie Hughes)</td>
</tr>
<tr>
<td>2:30 pm - 2:45 pm</td>
<td>Lunch Break</td>
<td>Break (Salon C)</td>
</tr>
<tr>
<td>Time</td>
<td>Operational and Medical Track (Salon A)</td>
<td>En-Route Care Track (Wilson/Harrison)</td>
</tr>
<tr>
<td>-----------</td>
<td>---------------------------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>3:15 pm - 3:45 pm</td>
<td>A Model Graduate Medical Education Military Unique Training Program (Lt Col Vinod Gidvani-Diaz)</td>
<td>Quality of limb salvage following wartime extremity vascular injury: results of a novel patient-based outcomes study (Lt Cdr Adam Stannard (Royal Navy))</td>
</tr>
<tr>
<td>3:45 pm - 4:15 pm</td>
<td>An Overview of Combat Wound Initiative Program and Biosurveillance Efforts at Armed Forces Institute of Pathology (Dr. Mina Izadjoo)</td>
<td>Traveling Fellowship to the United Kingdom as an adjunct to general surgical research and training (Lt Cdr Adam Stannard (Royal Navy))</td>
</tr>
</tbody>
</table>

**WEDNESDAY, August 25, 2010**

<table>
<thead>
<tr>
<th>Time</th>
<th>Operational and Medical Track (Salon A)</th>
<th>En-Route Care Track (Wilson/Harrison)</th>
<th>Force Health Protection Track (Salon B)</th>
<th>Nursing Track (Jackson)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 am - 8:30 am</td>
<td>Glucose Control in Critically Ill Adults at a Military Hospital (Maj Brian Allenbrand)</td>
<td>Enhancement in Communication of Performance Improvement Events within a Global Military Trauma System (Ms. Kathleen Martin)</td>
<td>Embedded Fragments - A Unique Exposure Situation and Concerns of Possible Health Effects (Dr. Jose Centeno)</td>
<td></td>
</tr>
<tr>
<td>8:30 am - 9:00 am</td>
<td>Management and Treatment of Pediatric Obesity in a Military Outpatient Setting (Dr. Jodi Krall)</td>
<td>Local Hemostatic Agents in a Survival Model of a Lethal Porcine Liver Injury (Maj Bradley Putty)</td>
<td>The Evaluation of Nanoparticles as Biological Decontaminants (Dr. Clarise Starr)</td>
<td></td>
</tr>
<tr>
<td>9:00 am - 9:30 am</td>
<td>Budget Impact Analysis of Bariatric Surgery for Morbid Obesity (Dr. Rafael Alfonso)</td>
<td>Affect of Altitude on Extremity Compartment Syndrome (ECS) (Dr. John Kains)</td>
<td>Toxicology &amp; ESOH Issues of Engineered Nanomaterials (Dr. Saber Hussain)</td>
<td></td>
</tr>
<tr>
<td>9:30 am - 9:45 am</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9:45 am - 10:15 am</td>
<td>Pilot Study of A Diabetes Prevention Program in A Military Community (Capt Lisa Strickland)</td>
<td>Bacterial Growth at Altitude (Capt Ryan Earnest)</td>
<td>Evaluation of Jet Fuel Induced Hearing Loss in Rats (Dr. David Mattie)</td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>Operational and Medical Track (Salon A)</td>
<td>Enroute Care Track (Wilson/Harrison)</td>
<td>Force Health Protection Track (Salon B)</td>
<td></td>
</tr>
<tr>
<td>--------------------</td>
<td>----------------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>10:15 am - 10:45 am</td>
<td>Decreased Blood Glucose Levels Among Metformin Dependent Diabetics Undergoing Hyperbaric Oxygen Treatment (Maj Todd Huhn)</td>
<td>Technical Evaluation of Enroute Care Mechanical Ventilation (SMSgt Dario Rodriquez)</td>
<td>Toxicity and Health Hazard Assessment for Synthetic Paraffinic Kerosene (Dr. David Mattie)</td>
<td></td>
</tr>
<tr>
<td>10:45 am - 11:15 am</td>
<td>Team Based Approach to Diabetes Care (Lt Col Mark True)</td>
<td>Joint Medical Distance Support and Evacuation (JMDSE), Joint Capability (CDR Greg Cook)</td>
<td>Cellular Bioeffects Thresholds for Terahertz Frequency (Dr. Gerald Wilmink)</td>
<td></td>
</tr>
<tr>
<td>11:15 am - 12:45 pm</td>
<td>Lunch Break</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:45 pm - 1:15 pm</td>
<td>The Effect of Special Duty Subpopulations on the Prevalence of Secretive Behaviors in the USAF (Col Mary Brueggemeyer)</td>
<td>Field Intravenous Fluid Reconstitution (FIVR) (Lt Col Steven Stern)</td>
<td>Development of a Health-Belief-Model-Based Instrument to Assess Worker Beliefs about using PPE (Lt Col Jack Wall)</td>
<td></td>
</tr>
<tr>
<td>1:15 pm - 1:45 pm</td>
<td>The Association Between Mental Health and Cigarette Smoking in Active Duty Military Members (Maj Erich Schroeder)</td>
<td>A comparison of proximal tibia, proximal humerus and distal femur infusion rates under high pressure using the EZ-IO Intraosseous device on an adult swine model (Maj Julio Lairet)</td>
<td>Nucleic Acid and Protein Detection Technology: Limitations, Milestones, and the Continuous Search for the Holy Grail (Dr. Clarise Starr)</td>
<td></td>
</tr>
<tr>
<td>1:45 pm - 2:15 pm</td>
<td>The Association Between Mental Health and Hypertension in the 2005 DoD Population Survey (Lt Col Scott Zaleski)</td>
<td>Inflammation Following Hemorrhage and AE (Dr. Tim Pritts)</td>
<td>Upper Respiratory Virus Serotype Panel for the Pyrosequencer (Dr. James Baldwin)</td>
<td></td>
</tr>
<tr>
<td>2:15 pm - 2:30 pm</td>
<td>Lunch Break</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:30 pm - 3:00 pm</td>
<td>Psychosocial Stress of RPA Operators (Dr. Wayne Chappelle)</td>
<td>MAF Aircrew Fatigue Countermeasures Survey (Col Karen Klingenberger)</td>
<td>The Use of Retinal Photographs For AFSOC Flyers at Risk For Laser Eye Injuries: Evaluation as Screening Exam (Lt Col Chris Hudson)</td>
<td></td>
</tr>
<tr>
<td>3:00 pm - 3:30 pm</td>
<td>Factor Analysis of MAB-II Neuropsychological Screening in Rated USAF Pilots (Maj Bret Heerema)</td>
<td>Enroute Care Roundtable (Wilson/Harrison) (Air Mobility Command/Mr. Calvin Griner)</td>
<td>Visual Performance Enhancement with Macular Pigment in Glare Condition (Dr. Leon McLin)</td>
<td></td>
</tr>
</tbody>
</table>
### THURSDAY, August 26, 2010

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 am - 8:30 am</td>
<td><strong>Break (Salon C)</strong></td>
</tr>
<tr>
<td>8:30 am - 9:00 am</td>
<td><strong>Blood Pharming:</strong> <strong>Dr. Stewart Abbot, Celgene Cellular Therapeutics</strong></td>
</tr>
<tr>
<td>9:00 am - 9:30 am</td>
<td><strong>Mild Traumatic Brain Injury and Sleep:</strong> <strong>Dr. Michael Russo, Traumatic Brain Injury Neurologist</strong></td>
</tr>
<tr>
<td>9:30 am - 9:45 am</td>
<td><strong>Defense Centers of Excellence (DCoE): Dr. George Johnson, TBI Directorate</strong></td>
</tr>
<tr>
<td>9:45 am - 10:15 am</td>
<td><strong>Break (Salon C)</strong></td>
</tr>
<tr>
<td>10:15 am - 10:45 am</td>
<td><strong>DoD “Use of Laboratory Animals” Updates:</strong> <strong>COL Annette Hildabrand, Deputy Director, Animal Use Programs</strong></td>
</tr>
<tr>
<td>10:45 am - 11:15 am</td>
<td><strong>Simulation Training Research- Trauma Man:</strong> <strong>Capt Andrew Hall, 81 MDG</strong></td>
</tr>
<tr>
<td>10:45 am - 11:15 am</td>
<td><strong>Joint Technical Coordinating Group (JTCG) Updates:</strong> <strong>Col Ray Santullo, Air Force Liaison to JTCG</strong></td>
</tr>
<tr>
<td>Time</td>
<td>Event</td>
</tr>
<tr>
<td>-------------------</td>
<td>--------------------------------------</td>
</tr>
<tr>
<td>11:15 am – 11:30 am</td>
<td>Break (Salon C)</td>
</tr>
<tr>
<td>11:30 am – 12:00 pm</td>
<td><strong>Leadership Brief:</strong> Lt Gen Bruce Green, Air Force Surgeon General</td>
</tr>
<tr>
<td>Additional Meetings</td>
<td>Available Rooms</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td><strong>Monday, 23 August 2010</strong></td>
<td><strong>CME/CNE/CEU</strong></td>
</tr>
<tr>
<td>12:00 pm – 5:00 pm</td>
<td>Military Vaccine Agency (MILVAX)</td>
</tr>
<tr>
<td>(Washington Ballroom)</td>
<td>Arlington Convention and Visitors Association</td>
</tr>
<tr>
<td>Medical Modernization/Research Management Working Group</td>
<td>BY INVITATION ONLY</td>
</tr>
</tbody>
</table>
Appendix B.

List of Attendees
Maj Lea A Calderwood
MSC, Air Force
AE Acquisitions
HQ AMC
Scott AFB
203 W Losey, Suite 1600
Scott AFB, IL 62225
lea.calderwood@scott.af.mil

Ms. Jessica Candia
Civilian, Air Force
Program Manager
AFMSA
Pentagon
5201 Leesburg Pike
Falls Church, VA 22041
jessica.candia@pentagon.af.mil

Col Charles R Carlton
BSC, Air Force
Chief Aerospace and Operational Physiology
HQ ACC 5G
Langley AFB
HQ ACC SGPT
162 Dodd Blvd
Langley AFB, VA 23662
charles.carlton@langley.af.mil

Brig Gen James J Carroll
BSC, Air Force
Commander, Air Force Medical Support Agency
AFMSA
HQ USAF
Bolling AFB
1500 Wilson Blvd
Arlington, VA 22209
ana.vargas@pentagon.af.mil

Maj Nathan Ceeava
MC, Air Force
Radiology Resident
59 RSQ
AETC
Lackland AFB
14023 Bella Donna
San Antonio, TX 78253
nateceeava@gmail.com

Dr. Jose A Centeno
Civilian, Army
Supervisory Research Chemist
AFIP - Washington DC
MEDCOM
Armed Forces Institute of Pathology
Dept. of Environ. & Infectious Disease
6825 16th Street, NW, Bldg. 54
Washington, DC, DC 0
jose.a.centeno@us.army.mil

Dr. Wayne Chappelle
Civilian, Air Force
Senior Clinical Research Psychologist
USAFSAM
AFMC
Brooks AFB
2507 Kennedy Circle
San Antonio, TX 78235
wayne.chappelle@brooks.af.mil

Maj John D Childs
BSC, Air Force
Associate Professor & Director of Research
US Army-Baylor University
Fort Sam Houston
2532 Melville Lane
Schertz, TX 78154
childsjd@gmail.edu

Maj James Chisolm
MSC, Air Force
Medical Modernization Program Element Monitor
AFMSA
HQ USAF
AF District of Washington
5201 Leesburg Pike
Falls Church, VA 22041
james.chisolm@pentagon.af.mil

Dr. Salvatore M Cirone
Civilian
Program Director, Health Science Policy
Health Affairs, DOD
AF District of Washington
5113 Leesburg Pike
Skyline 4, Suite 901
Falls Church, VA 22041
Salvatore.Cirone@hra.osd.mil

Mr. Scott Cobb
SVP Federal & Healthcare Systems
Shipcom HealthcareKeessler AFB
11200 Richmond Ave
Suite 552
Houston, TX 77082
scobb@shipcomwireless.edu

Dr. Stefan H Constable
Civilian, Air Force
Deputy Director
AFRL, AFMC
Brooks AFB
2485 Gillingham Dr.
HPW/HP
Brooks City-Base, TX 78235
stefan.constable@brooks.af.mil

Mr. Glenn T Conway
Air Force
Functional Analyst
AFMSA
HQ USAF
Pentagon
5021 Leesburg Pike, Suite 1206
Falls Church, VA 22041
gconway@plan-sys.edu

Mr. Raul Corpus
Air Force
Project Manager
AFMSA
HQ USAF
Lackland AFB
10207 Dancing Brook
San Antonio, TX 78254
raul.corpus.ctr@us.af.mil

LCDR Ryan P Costello
USPHS
Regional Representative
ATSDR
AF District of Washington
ATSDR - Office of Regional Operations
1200 Pennsylvania Ave, NW 5203P
Washington, DC 20460
costello.ryan@epa.gov

Lt Col Marcus M Cranston
MC, Air Force
Preventive Medicine Physician
81 AMDS
AETC
Keelser AFB
81 AMDS/SGPZ
Keelser AFB, MS 39564
marcus.cranston@us.af.mil
Dr. Russell J Davis  
Air Force  
IT Specialist  
AFMSA/OCIO  
AF District of Washington  
Sky 3, Suite 1511, 5201 Leesburg Pike  
Falls Church, VA 22041  
russell.davis@pentagon.af.mil

Lt Col Michael R Davis  
MC, Air Force  
Plastic an Reconstructive Surgeon  
88SGOS  
AFMC  
Wright-Patterson AFB  
4881 Sugar Maple Dr  
88SGOS/SGCQP  
Wright-Patterson AFB, OH 45433  
Michael.Davis@wpafb.af.mil

Col Marla J De Jong  
NC, Air Force  
Executive Director, TriService Nursing Research Program  
USUHS  
AF District of Washington  
4301 Jones Bridge Road  
Bethesda, MD 20814  
marla.dejong@usuhs.mil

Ms. Jenny Dean  
Air Force  
Clinical Research Coordinator  
779 MDG  
AFDW  
Andrews AFB  
Camp Springs, MD 20762  
jennifer.dean.ctr@afncr.af.mil

Ms. Jennifer D Dean  
Civilian, Air Force  
Clinical Research Coordinator  
779 MDG  
AFDW  
Andrews AFB  
779th Medical Group  
1050 West Perimeter Road RMF103  
Andrews AFB, MD 20762  
jennifer.dean.ctr@afncr.af.mil

Mr. CharlesDean  
Civilian, Air Force  
Business Integration Specialist  
711 HPW  
AFMC  
Brooks AFB  
2510 Kennedy Circle  
Brooks City-Base, TX 78132  
charles.dean@brooks.af.mil

Dr. Peter Demitry  
MC, Air Force  
Exec Consultant  
AF District of Washington  
3700 Drake Ln  
Haymarket, VA 20169  
demitry@me.edu

Maj Michael P Dempsey  
BSC, Air Force  
Head, Scientific Research Department  
AFRI/USUHS  
AFDW  
AF District of Washington  
8901 Wisconsin Ave  
Bethesda, MD 20889  
dempsey@afri.usuhs.mil

Maj Jacqueline Dent  
MSC, Air Force  
Chief, Requirements Policy Branch  
AFMSA  
AF District of Washington  
5201 Leesburg Pike  
Ste 1501  
Falls Church, VA 22041  
jacqueline.dent@pentagon.af.mil

Mr. Nehal N Desai  
Civilian, Air Force  
Modernization Engineer  
AFMSA/SGR  
Pentagon  
5201 Leesburg Pike  
Suite 1002  
Falls Church, VA 22041  
nehal.desai@pentagon.af.mil

Ms. Stephanie Desai  
Senior Executive Assistant  
DOD  
Pentagon  
2345 Crystal Drive Suite 120  
Arlington, VA 22202  
stephanie.desai.ctr@tma.osd.mil

Ms. Theresa L DiFato  
NC  
Contract Support - JMDSE  
USJFCOM  
DOD  
US Joint Forces Command  
4644 Allens Mil  
1 Blvd  
Haymarket, VA 20169  
lynn.difato@trifacta-solutions.edu

Lt Col James H Dienst  
BSC, Air Force  
Director, BSC Operations  
AFMOA  
Lackland AFB  
485 QUENTIN ROOSEVELT RD  
SAN ANTONIO, TX 78226  
james.dienst@af.mil

Ms. Erica J Doczy  
Civilian, Air Force  
Biomedical Engineer  
711 HPW  
AFMC  
Wright-Patterson AFB  
2800 Q Street  
Bldg 824  
Wright Patterson AFB, OH 45433  
Erica.Doczy@wpafb.af.mil

Maj Thomas J Doker  
BSC, Air Force  
Public Health Flight Commander  
82 AMDS  
AETC  
Sheppard AFB  
149 Hart Street  
Sheppard AFB, TX 76311  
thomas.doker@sheppard.af.mil

Dr. Warren C Dorlac  
MC, Air Force  
Director CSTARS Cin; Trauma Consult.  
CSTARS Cincinnati  
AFMS  
1319 Suncrest Dr.  
Cincinnati, OH 45208  
warren.dorlac@uc.edu

Maj Susan F Dukes  
NC, Air Force  
PhD Student  
AFIT  
Wright-Patterson AFB  
1332 Cape St. Claire Rd #651  
Annapolis, MD 21409  
sailing63@aol.edu

Capt Ryan E Earnest  
MC, Air Force  
General Surgery Resident  
88 MDG  
AFMC  
Wright-Patterson AFB  
4881 Sugar Maple Dr.  
WPAFB, OH 45433  
ryan.earnest@gmail.edu
Proceedings of the 2010 AFMS Medical Research Symposium
Volume 1  Plenary Sessions and Abstracts

Mr. Elton R. Green
Civilian, Air Force
Project Manager, Diabetes Prevention Research
AFMSA
HQ USAF
Lackland AFB
10142 Stone Garden
San Antonio, TX 0
elton.green.2.ctr@us.af.mil

Mr. Calvin R Griner
NC, Air Force
Enroute Care SME
AFMSA
Bolling AFB
5201 Leesburg Pike Suite 1012
Falls Church, VA 22041
calvin.griner.ctr@pentagon.af.mil

Ms. Jennifer P Hervey
Civilian, Air Force
Mental Health Technician
USAFSAM
AFMC
Brooks AFB
12222 Vance Jackson
Apt.226
San Antonio, TX 78230
jennifer.hervey.ctr@us.af.mil

Col Richard G Griffith
MC, Air Force
Senior Director, Assistant Surgeon General, Modernization
HQ USAF
Bolling AFB
5201 Leesburg Pike Suite 1012
Falls Church, VA 22041
richard.griffith-03@pentagon.af.mil

Ms. Bobbie J Hicks
Air Force
Project Manager
AFMSA
AFDW
Bolling AFB
5201 Leesburg Pike
Skyline 3, Suite 1012
Falls Church, VA 22041
bobbie.hicks@pentagon.af.mil

Col Annette Hildabrand
Army
Deputy Director, Animal Use Programs
MEDCOM
DOD
AR-Medcom
BioSystems, OSD
Falls Church, VA 22041
annette.hildabrand@osd.mil

Mr. John P. Hinz
Civilian, Air Force
Toxicologist
USAFSAM
AFMC
Brooks AFB
2513 Kennedy Circle - Bldg #180
Brooks City-Base
San Antonio, TX 78235
john.hinz@us.af.mil

Dr. Gustavo S Guandalini
Civilian, Army
Research Associate
DOD
Armed Forces Institute of Pathology
6825 16th NW
Washington, DC 20306
Gustavo.Guandalini@us.army.mil

Ms. Sharon R Gustaitis
Air Force
Research Management and Program Analyst
USAF/SF AFMSA
Lackland AFB
1202 Heavens Peak
San Antonio, TX 78258
sharon.gustaitis.ctr@us.af.mil

COL Dallas C Hack
MC, Army
Director, US Army Combat Casualty Care Research Program
MEDCOM, DOD
Fort Detrick
504 Scott St
 Ft. Detrick, MD 21702
Dallas.Hack@amedd.army.mil

Ms. Laura Sherman
Civilian, Air Force
Deputy Director, Animal Use Programs
MEDCOM
DOD
AR-Medcom
BioSystems, OSD
Falls Church, VA 22041
laura.sherman@pentagon.af.mil

COL Glenn Hover
BSC, Air Force
Deputy Chair, Aeromedical Research Dept
USAFSAM, AFMC
Brooks AFB
2507 Kennedy Cir
brooks city-base, TX 78235
glenn.hover@brooks.af.mil

Lt Col Christopher M Hudson
MC, Air Force
Chief, Aerospace Medicine
377 MDG, AFMC
Kirtland AFB
2050A 2nd St SE
Kirtland AFB, NM 87111
christopher.hudson@kirtland.af.mil

Mr. Col Dyana Hagen
BSC, Air Force
Chief, Lab Research Operations
60 MDG
AMC
Travis AFB
PO Box 1749
Travis AFB, CA 94535
dyana.hagen-02@travis.af.mil

Capt Andrew B Hall
MC, Air Force
Physician
81 MSGS, AETC
Keesler AFB
Clinical Research Lab
301 Fisher St. Rm BA 144
Keesler AFB, MS 39534
andrew.hall.2@us.af.mil

Capt Heather M Hancock
MC, Air Force
General Surgery Resident/ Research Fellow
59th MDG
AETC
Lackland AFB
11368 Blazing Sunset
San Antonio, TX 78253
heather.hancock@us.af.mil

Maj Ileana Hauge
BSC, Air Force
SRD Deputy, Senior Research Scientist
AFRRI
Andrews AFB
AFRRI Research Institute
8901 Wisconsin Ave, Bldg.42/R.1318
Bethesda, MD 0
Hauge@afirri.usuhs.mil

Maj Bret Heerema
MC, Air Force
RAM
USAFSAM
AFMC
Brooks AFB
2601 Louis Bauer Dr.
Brooks City-Base, TX 78235
bret.heerema@brooks.af.mil

Brig Gen Byron C Hepburn
MC, Air Force
Air Force Deputy Surgeon General
HAF/SF
HQ USAF, Pentagon
1500 Wilson Blvd
Suite 1600
Arlington, VA 22209
laura.sherman@pentagon.af.mil
Proceedings of the 2010 AFMS Medical Research Symposium
Volume 1  Plenary Sessions and Abstracts

Dr. Larry P Krock
Civilian, Air Force
Chief Scientist
USAFSAM
AFMC
Brooks AFB
USAFSAM/CS
2601 Louis Bauer Drive
Brooks City-Base, TX 78236
larry.krock@us.af.mil

Mr. William J LaFountan
Civilian, Air Force
Technical Expert for Industrial Hygiene and Occupational Health
ASC
AFMC
Wright-Patterson AFB
ASC/EEV
1801 10th St., Bldg. 8
WPAFB, OH 45433
william.lafountain@wpafb.af.mil

Maj Jeffrey D Lewis
MC, Air Force
Cognitive Neuroscience Fellow
AETC
Bolling AFB
10 Center Drive, MSC 1440
Bldg. 10, Room 7D43
Baltimore, MD 20892
jeff.lewis@nih.gov

Ms. Pamela S Logan
Air Force
Congressional Liaison
AFMSA
Bolling AFB
5201 Leesburg Pike, Suite 1100
Falls Church, VA 22041
pamela.logan@pentagon.af.mil

Lt Col Kim London
Air Force
Legal Advisor
711 HPW
AFMC
Wright-Patterson AFB
2245 Monahan Way Bldg 29
Wright Patterson AFB, OH 45433
kim.london@wpafb.af.mil

Col Thomas Luna
MC, Air Force
Associate Dean, Aerospace Medicine
USAFSAM
AFMC
Brooks AFB
USAFSAM/ED
2601 Louis Bauer Dr
Brooks City-Base, TX 78235
thomas.luna@us.af.mil

Capt Mark E Lytle
MC, Air Force
General Surgery Resident
81 MDG
AETC
Keesler AFB
301 Fisher St
Biloxi, MS 39534
mark.lytle@us.af.mil

Maj Wendy L Mack
MSC, Air Force
Chief, Policy Requirements Branch
AFMSA
Pentagon
5201 Leesburg Pike
Falls Church, VA 22041
wendy.mack@pentagon.af.mil

Maj Carlos J Maldonado
BSC, Air Force
Chief, Molecular Diagnostics
60 MDG, AMC
Travis AFB
101 Bodin Circle
Travis AFB, CA 94535
carlos.maldonado@us.af.mil

Capt Nickolay P Markov
MC, Air Force
Resident
59MDW, DOD
Brook Army Medical Center
9111 Arroyo Hondo
Helotes, TX 78023
nickolay.markov@amedd.army.mil

Ms. Kathleen D Martin
Civilian, Army
Trauma Program Nurse Director
US Army, DOD
Landstuhl Regional Medical Center
CMR 402
BOX 1277
APO, AE 9180
kathleen.martin2@amedd.army.mil

Dr. David I Maserang
Civilian, Air Force
Chief of Applied Technology Center
USAFSAM
AFMC
Brooks AFB
2484 Gillinham Drive
Bldg 175W
Brooks City-Base, TX 0
david.maserang@brooks.af.mil

Mr. James B Mason
Air Force
Sr. Telemedicine Consultant
HQ USAF
AFMSA
Lackland AFB
2200 Bergquist Dr.
Ste 1
San Antonio, TX 78236
James.mason.26.ctr@us.af.mil

Dr. Patrick A Mason
Civilian, Air Force
Chief, Strategic Planning Branch
SAF/AQRS
HQ USAF
Pentagon
1060 Air Force Pentagon
Washington, DC
patrick.mason@pentagon.af.mil

62
Proceedings of the 2010 AFMS Medical Research Symposium
Volume 1  Plenary Sessions and Abstracts

Col Brian J Masterson
MC, Air Force
Command Surgeon
HQ AFRC
AFRC
Robins AFB
135 Page Rd
Robins AFB, GA 31098
brian.masterson@us.af.mil

Dr. Manoj Mathew
Civilian, Air Force
Clinical Research Coordinator
USAF
AETC
Lackland AFB
2200 Bergquist Drive, Ste 1
Lackland AFB, TX
San Antonio, TX 0
manoj.mathew.ctr@us.af.mil

Mr. Michael Mitchell
Civilian
Contract IM/IT Analyst
ACC SG
ACC
Langley AFB
162 Dodd Blvd
Langley AFB, VA 23665
michael.mitchell1@langley.af.mil

Mr. Lawrence E Mitchell
Civilian, Air Force
Deputy, Modernization Directorate
AFMSA
Pentagon
5201 Leesburg Pike
Suite 1012
Falls Chrch, VA 22041
Lawrence.Mitchell@pentagon.af.mil

Ms. Rachel A Montez
Civilian, Air Force
Protocol Coordinator
Wilford Hall Med Ctr
AETC
Lackland AFB
59th Clinical Research Div
2200 Bergquist Dr, Bldg 4430
Lackland, TX 78236
rachel.montez@us.af.mil

LTC Brian D Moore
MC, Army
Project Manager
MEDCOM
Fort Detrick
504 Scott Street
Ft. Detrick, MD 21702
brian.david.moore@us.army.mil

Capt Tylan Muncy
MC, Air Force
Emergency Medicine Resident
59 EMDS
AETC
Lackland AFB
8823 Feather Trail
Helotes, TX 78023
tylan.muncy@yahoo.edu

Mr. William (Bill) S Murray
Civilian, Air Force
SME, Research
AFMSA
HQ USAF
AF District of Washington
5201 Leesburg Pike
Skyline 3
Fall Church, VA 22041

Lt Col Joseph J Narrigan
BSC, Air Force
Chief, Modernization
HQ AFMC
Wright-Patterson AFB
4225 Logistics Ave
Room N-209
Wright-Patterson, OH 45433
joseph.narrigan@us.af.mil

Col William E Nelson
MC, Air Force
Chief, Aerospace Medicine Policy and Operations
USAF
HQ USAF
Pentagon
1500 Wilson Blvd.
Arlington, VA 22209
william.nelson@pentagon.af.mil

Dr. Jeff L Nelson
Civilian, Air Force
Advanced Instructor of Physical Education
(Exercise Physiologist)
HQ USAFA
Air Force Academy
HQ USAFA/ADPH
2169 Field House Drive/Ste 111
USAF Academy, CO 80840
jeffrey.nelson@usafa.edu

Col James S Neville
MC, Air Force
Chief, Applied Clinical Epidemiology
AFMOA
Lackland AFB
485 Quentin Roosevelt Rd.
Bldg 171 Room 400
San Antonio, TX 78226
james.neville@us.af.mil

Lt Col Scott M Nicholson
BSC, Air Force
Chief, Radiofrequency Radiation Branch
AFRL, AFMC
Brooks AFB
711 HPW/RHDR
8262 Hawks Road
Brooks City-Base, TX 78235
Scott.Nicholson@brooks.af.mil
Proceedings of the 2010 AFMS Medical Research Symposium
Volume 1  Plenary Sessions and Abstracts

Dr. Terry M. Rauch  
Civilian  
Program Director, Defense Medical Research and Development  
OASD (Health Affairs), DOD  
Pentagon  
5113 Leesburg Pike  
Skyline 4, Suite 901  
Falls Church, VA 22041  
terry.rauch@ha.osd.mil

Col Patricia A Reilly  
BSC, Air Force  
Chief, Biosciences and Protection Division  
711 HPW, AFMC  
Wright-Patterson AFB  
2215 1st St  
Building 33, Room 325  
Dayton, OH 45433  
patricia.reilly@wpafb.af.mil

Mr. Andrew Reinert  
, Air Force  
Medical Research Manager  
AFSOC  
Hurlburt FLD  
100 Bartley St  
Hurlburt Field, FL 32544  
andrew.reinert.ctr@hurlburt.af.mil

Col David B Rhodes  
MC, Air Force  
Program Director, Residency in Aerospace Medicine (RAM)  
USAFSAM, AFMC  
Brooks AFB  
2601 Louis Bauer Drive  
Ste E160  
Brooks City-Base, TX 78235  
david.rhodes@us.af.mil

Lt Col (Retired) Welford C Roberts  
MSC, Army  
Occupational Toxicology SME  
Surgeon's Office of Modernization  
Bolling AFB  
5201 Leesburg Pike  
Suite 1206  
Falls Church, VA 22041  
wroberts@plan-sys.edu

SMSGt Dario Rodriguez  
Enlisted, Air Force  
Superintendent, Medical Services Flight  
88 MDOS  
AFMC  
Wright-Patterson AFB  
10109 Whittlesey Drive  
Union, KY 41091  
dario.rodriguez@wpafb.af.mil

Lt Col David M Rogers  
MC, Air Force  
Commander, Chief of Aerospace Medicine  
7 AMDS  
ACC  
Dyess AFB  
697 Louisiana Drive  
Dyess AFB, TX 79606  
david.rogers@dyess.af.mil

Mr. James E Rollins  
Consultant  
Policy Navigation Group  
AF District of Washington  
9010 Linda Maria Court  
Fairfax, VA 22031  
JEROLLINS@POLICYNAVIGATION.edu

Col Donald E Ross  
MC, Air Force  
Chief Aerospace Medicine Interoperability  
HQ USAF  
Pentagon  
Suite 1200  
1500 Wilson Boulevard  
Arlington, VA 22209  
donald.ross.grb@pentagon.af.mil

Dr. Michael B Russo  
MC, Army  
TBI Neurologist  
PACOM  
Tripler Army Medical Center  
111 Hekili Street  
STE A502  
Kailua, HI 96734  
MikeBRusso@Gmail.edu

Dr. Robert S Ryczak  
MSC, Army  
Preventive Medicine Planner  
OTSG/MECOM Prev Med  
Aberdeen Proving Ground  
DASG-PPM-EA (Dr Ryczak)  
5158 Blackhawk Road, Bldg E1930  
Aberdeen Proving Ground, MD 0  
robert.ryczak@us.army.mil

Ms. Elizabeth C Sanchez  
, Air Force  
Project Manager  
AFMSA  
Pentagon  
5201 Leesburg Pike, Suite 1001  
Falls Church, VA 22031  
elizabeth.sanchez.ctr@pentagon.af.mil

Ms. Nereyda L Sevilla  
Air Force  
Senior Analyst/Aerospace Physiologist  
AFMSA  
HQ USAF  
AF District of Washington  
5201 Leesburg Pike  
Falls Church, VA 22041  
nereyda.sevilla@pentagon.af.mil

Mr. Danny J Sharon  
BSC, Air Force  
Contractor  
AFMSA  
Lackland AFB  
1777 N.E. Loop 410  
Suite 1009  
San Antonio, TX 78217  
adlos@sbcglobal.net
Proceedings of the 2010 AFMS Medical Research Symposium
Volume 1  Plenary Sessions and Abstracts

candy.wilson@us.af.mil
Mr. Frederick L Woods
MSC, Air Force
Program Manager, AFMSA
Bolling AFB
5201 Leesburg Pike, Suite 1007
Falls Church, VA 22041
frederick.woods.ctr@pentagon.af.mil

Brig Gen Daniel O Wyman
MC, Air Force
Command Surgeon
ACC
Langley AFB
162 Dodd Blvd
Langley AFB, VA 23665
daniel.wyman@langley.af.mil

Lt Col Scott D. Zaleski
MC, Air Force
Resident in Aerospace Medicine
USAFSAM
AFMC
Brooks AFB
2601 Louis Bauer Dr
Brooks City-Base, TX 0
scott.zaleski@brooks.af.mil

Lt Col Michael F Zupan
BSC, Air Force
Director, Human Performance Laboratory
Department of Athletics
USAF ACADEMY
Air Force Academy
2169 Fieldhouse Drive
USAFA, CO 80840

Michael.Zupan@USAFA.EDU

69
Appendix C.

Continuing Education

This year the symposium granted Continuing Medical Education (CME) and Continuing Nursing Education (CNE) credits for the scientific presentations. Each presentation was worth 0.5 credits. The symposium also granted education credits for Sanitarians and Environmental Health Professionals (Registered Sanitarians [R.S] and Registered Environmental Health Specialists [R.E.H.S.]) from the National Environmental Health Association (NEHA), and Certified Industrial Hygienists (C.I.H.) from the American Board of Industrial Hygiene (ABIH).
Appendix D.

Keeping Our Promise Through Medical Research and Development

Dr. Peach Taylor
Deputy Assistant Secretary of Defense for Force Health Protection & Readiness
"Keeping Our Promise Through Medical Research and Development
5th Annual Air Force Medical Research Symposium
August 16, 2010

Dr. George Peach Taylor
Deputy Assistant Secretary of Defense
for Force Health Protection & Readiness

"No Higher Priority"

"Beyond waging the wars we are in, treatment of our wounded, their continuing care, and eventual reintegration into everyday life is my highest priority."

"I consider this a solemn pact between those who have risked and suffered, and the Nation that owes them its eternal gratitude."

Robert M. Gates
Secretary of Defense

Force Health Protection and Readiness

Shapes defense-wide health care and deployment medical support capabilities to improve, protect, and conserve the health and resilience of Service members for optimal mission performance across global military activities and operations.*

FHP&R Program Directorates

FHP&R is responsible for military health care policy and is comprised of nine Program Directorates:

- Civil – Military Medicine
- Force Readiness and Health Assurance
- Medical Logistics
- Deployment Technologies and Support Programs
- Defense Health Program Medical Research and Development
- Operational Medicine and Medical Force Readiness
- International Health
- Medical Countermeasures
- Psychological Health

*See FHP&R FHS

72
The Military Health System

The MHS is a large and complex organization

- Integral component of America’s fighting forces – and a military medical system unlike any other in the world
- A hospital system - 50 hospitals worldwide
- An integrated medical system - 364 medical clinics, 262 dental clinics
- An education, training and research institution
  - Medical school and graduate programs
  - 36 medical research laboratories
  - Scholarship programs across most major universities
  - Comprehensive medical research & development programs
- A health insurance plan
  - 5.8 million covered lives
  - Over 100,000 network providers

Military Health System Mission –

Peacetime and Wartime

- Patient Care, Sustain Skills and Training
- Protect & Promote Health of the Force
- Deploy to Support the Commander

Continuum of Care

DHP Medical Research and Development

- Develops R&D planning, programming, budgeting, and execution strategies
- Communicates guidance to organizations using DHP R&D&E funds
- Focal point for all DHP medical R&D actions and communications
Funding Opportunities for the “Enhanced” Part of the DHP R&D Program

- Medical R&D Development
  - Diagnostics and Treatment of Brain Injury
  - Polytrauma and Blast Injury
  - Infectious Diseases
  - Radiology
  - Operational Health and Performance
  - Rehabilitation
  - Psychological Health and Well-Being for Military Personnel and Family
  - Medical Training Systems, Modeling and Simulations

Polytrauma & Blast Injury

How to Compete for FY 2011 Intramural R&D Funding

- Must be an intramural investigator – a DoD employee working within a DoD facility
- Must go through Proposal Approval Process
  - Pre-proposal submission
  - Compliance and programmatic relevance review by a JPC
  - Invite full proposal submission
  - External scientific peer review
  - Military relevance and programmatic review by a JPC
  - GOR established
  - Written notification to PI of proposal funding recommendation
BRAC: Creating Research Centers of Excellence

- Battlefield Health and Trauma Research at Fort Sam Houston, TX
- Infectious Disease Research at Walter Reed, Forest Glen, MD
- Aerospace Medicine Research at Wright Patterson AFB, OH
- Joint Biomedical Research, Development and Acquisition Management Center at Fort Detrick, MD.
- Medical Biological Defense Research at Fort Detrick, MD
- Chemical Biological Defense Research, Development & Acquisition at Aberdeen Proving Ground, MD

“No Higher Priority”

“Beyond waging the wars we are in, treatment of our wounded, their continuing care, and eventual reintegration into everyday life is my highest priority.

“I consider this a solemn pact between those who have risked and suffered, and the Nation that owes them its eternal gratitude.”

Robert M. Gates
Secretary of Defense

Keeping Our Promise Through Medical Research and Development

3rd Annual Army Research Symposium
August 24, 2010

Dr. George Peach Taylor
Deputy Assistant Secretary of Defense
for Force Health Protection & Readiness
Appendix E.

Armed Forces Institute of Regenerative Medicine (AFIRM)

LTC Brian Moore
Program Manager
Our Science for Their Healing

AFIRM Medical Research Symposium

LTG Brian D. Moore
Deputy Project Director, Armed Forces Institute of Regenerative Medicine

The science and views expressed in this presentation are those of the author and not necessarily endorsed by the U.S. Army.

AFIRM Facts

- In May 2009, the U.S. Army Medical Research and Material Command, in partnership with the Army, Air Force, Veterans Health Administration, and National Institutes of Health, established AFIRM
- Two resources working together with the U.S. Army Institute of Surgical Research (IISR) scientists
- Initial 5-year funding of $10M
- Future growth
- Initial projects:
  - Project 1: Advanced technologies for developing effective therapies for nerve deficit, bone, skin and cardiac repair
  - Project 2: Advanced technologies for developing effective therapies for skin, bone, cardiac, and nerve repair

AFIRM Funding

<table>
<thead>
<tr>
<th>Project Area</th>
<th>Funding Sources</th>
<th>Total Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regenerative Medicine</td>
<td>George Washington University</td>
<td>$100,000</td>
</tr>
<tr>
<td>Skin Repair</td>
<td>University of California, San Francisco</td>
<td>$50,000</td>
</tr>
<tr>
<td>Bone Regeneration</td>
<td>University of Pennsylvania</td>
<td>$25,000</td>
</tr>
<tr>
<td>Nerve Repair</td>
<td>University of Pennsylvania</td>
<td>$25,000</td>
</tr>
<tr>
<td>Cardiac Repair</td>
<td>University of Pennsylvania</td>
<td>$25,000</td>
</tr>
</tbody>
</table>

AFIRM Partnership is a net-centric organization

- U.S. Army Institute of Surgical Research
- University of Virginia
- University of Utah

Wake Forest – Pittsburgh
- Wake Forest Institute for Regenerative Medicine (WFIRM)
- The McGowan Institute for Regenerative Medicine (IIRM)
- Allegheny-Singer Research Institute
- Georgia Tech University
- University of Pittsburgh
- University of California, San Francisco
- University of Pennsylvania
- Tufts University
- University of Virginia
- University of Utah

Rutgers – Cleveland Clinic
- Rutgers-New Jersey Medical School-Biomedical Sciences
- Cincinnati Children’s Hospital Medical Center
- Cleveland Clinic Foundation
- Cleveland Clinic Florida
- Cleveland Clinic Laboratories
- Cleveland Clinic Lou Ruvo Center for Brain Health
- University of Cincinnati
- University of Cincinnati College of Medicine
- University of New Mexico
- University of North Carolina at Chapel Hill
- University of Pennsylvania
- University of Pennsylvania School of Medicine
- University of Texas Southwestern Medical Center
- University of Washington
- University of Virginia
- University of Utah
- University of Vermont
- Virginia Tech University

<table>
<thead>
<tr>
<th>US Rank</th>
<th>University</th>
<th>in</th>
<th>in</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Harvard</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>2</td>
<td>MIT</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>3</td>
<td>UC-Pittsburgh</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>4</td>
<td>Columbia U</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>5</td>
<td>Tufts</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>6</td>
<td>Georgia Tech</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>7</td>
<td>Rice</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>8</td>
<td>Stanford</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>9</td>
<td>Case Western</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>10</td>
<td>Johns Hopkins</td>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>

Creation and Mission

- Department of Defense established the AFIRM in 2008
- Mission: To develop and accelerate regenerative solutions for the treatment of battlefield injuries, including:
  - Research and development of new therapies and regenerative products
  - Coordination of innovative clinical trials
  - Outreach to the community of wounded service members, veterans, and their families
  - Webinars
  - Personal meetings
  - Outreach to the DoD medical community
  - Grand Rounds
  - Traveling Fellows Program (TFF)
  - Collaboration with the DARPA and other interm DoD organizations

Five Major Programs

- Wake Forest-Pittsburgh & Rutgers Cleveland Clinic Consortium
  - Regenerative Medicine Programs
    - Chondral Regeneration
    - Burn
    - Compartment Syndrome
    - Limb & Digit Reconstruction
    - Soft Tissue Wound Healing

Translate Technologies

- Proof of Concept (TRL 2-4)
- Pre-Clinical Research (TRL 4-5)
- Clinical Trial (TRL 5+)

Metric for Success is Get It to the Patient
Reconstruction and repair of tissues and organs can be achieved through various approaches. These include scaffold-based strategies, cell-based therapies, and the use of bioactive materials.

**Scaffold**
- Provides a framework for tissue growth.

**Cell-based therapy**
- Utilizes stem cells or other specialized cells to regenerate tissue.

**Cell-Scaffold Hybrid**
- Combines both scaffold and cell-based approaches.

**2010 Clinical Trials: Hand Transplantation**
- **Goal:** Protocol for treatment of forearm or hand loss by transplantation with local immunomodulation.
- **Status:** Enrollment is currently underway.

**2010 Clinical Trials: Composite Tissue Allograft Transplantation for Face**
- RCCC has focused on patients with massive facial tissue loss.
- The team led by Maria Stammow, MD, Cleveland Clinic Foundation performed the first "face transplant" in the US.
- Recruiting patients for clinical trial: expect additional transplant within the next 6 months. Funding ($2 M) for a total of additional 2 patients.
- Failure: craniofacial reconstruction and nerve restoration via CTA.
- Major advantage: Optimal functional and cosmetic restoration.
- Major challenge: Immunosuppression therapy.

**2010 Clinical Trials: Muscle Regrowth**
- Epimorphic Regeneration

CT scan showing 18% increase in quadriceps mass (white arrow) of muscle post-surgery.
FY 2010 Clinical Trials

Fat Injections to Fill Facial Defects

Before

After

FY 2010-2011 Clinical Trials

Year of the Skin

Recell®
Skin Expander
Scarless Wound Healing
StrataGraft®

FY 2010 Clinical Trials

Cell Spraying to Reduce Burn Scarring

Before

After

FY 2010 Clinical Trials

ReCell for Scar Revision

Avita Medical
Proceedings of the 2010 AFMS Medical Research Symposium
Volume 1  Plenary Sessions and Abstracts

82
FY 2010 Clinical Trials Adipose Fat Transfer for Scar Remediation

Patient 1, Post-op 1 Week

- Treatment of an existing scar resulting in condensation (left) with significant improvement of function (right).

Planned AFIRM Clinical Trials

<table>
<thead>
<tr>
<th>Phase</th>
<th>FY11</th>
<th>FY12</th>
<th>FY13</th>
<th>FY14</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase I</td>
<td>5</td>
<td>11</td>
<td>10</td>
<td>3</td>
<td>Small safety trial or proof of principle (10-40 patients, 1 year)</td>
</tr>
<tr>
<td>Phase II</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>Medium safety/efficacy trial (approximately 40-100 patients, 2 years)</td>
</tr>
<tr>
<td>Phase III</td>
<td>D</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>Large efficacy trial for FDA clearance (&gt;100 patients, 3 years)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>10</td>
<td>16</td>
<td>18</td>
<td>11</td>
<td></td>
</tr>
</tbody>
</table>

Product breakdown:
- 15 Orthopaedic
- 9 Fiducial
- 3 Tear reduction
- 11 Burns

Summary

1. Established national teams collaborating together – still early but ahead of schedule.
2. Leading scientists in the field of regenerative medicine; includes industry partners.
3. Established resources – disciplined / programmatic.
4. Multiple product lines.
5. Overall impact of the program dependent on finding resources for clinical trials.

www.afirm.mil
Backup Slides

Newly Funded Clinical Trials

Goal: To Heal our Wounded Warriors

Five Areas of Emphasis
Appendix F.

Defense Technical Information Center (DTIC)

Ms. Shari Pitts
DTIC
Information Collection Division
DTIC’s Core Functions

- Central repository for Department of Defense (DoD) scientific and technical information (STI).
  - Source for acquiring, testing, tailoring, and disseminating DoD technical information.
- Oversees the management of 10 DoD Information Analysis Centers (IACs).
- Web services to over 100 DoD Web sites.
- Provides information support to the Office of the Secretary of Defense (OSD).
- Develops DoD scientific and technical information policy (STIP).
- Explores information technology.

DTIC’s Mission

To provide essential, technical research, development, testing & evaluation (RDT&E) information rapidly, accurately and reliably to support our DoD customers’ needs.
Proceedings of the 2010 AFMS Medical Research Symposium
Volume 1  Plenary Sessions and Abstracts

What Can DTIC Offer YOU?

Benefits to Customer:

User:
- Facilitate technology transfer and technology transition
- Reduce duplication of effort
- Identify potential sources of funding support
- Locate collaborators, technical support and expertise
- Provides access to medical journal articles for users who can not access Pub Med.

Real advantages...not just regulations

Information for the Defense Community

What Can DTIC Offer YOU?

Benefits to Customer:

Contributor:
- Contributor has "paperless" archive
- Contributor has cost savings because DTIC:
  ✓ catalogues and indexes
  ✓ handles secondary dissemination and authorizes dissemination of restricted documents
  ✓ ensures access and long-term storage
- Publication by DTIC makes contributor capabilities and technologies known to appropriate, authorized audiences

Real advantages...not just regulations

Information for the Defense Community

What Can DTIC Offer YOU?

Public Release Outlets

- Wide distribution of public release
  - National Technical Information Service (NTIS) www.ntis.gov
  - Online Computer Library Center (OCLC) www.oclc.org
    Combined catalog of over 1 trillion titles housed by 93,146 libraries in 96 countries
  - Open Archiving Initiative (OAI)
    http://www.dtic.mil/oaiaarchive/openarchive.html
  - Discoverable by WWW search engines - Google, Monster, Yahoo, etc.

- Preservation and public access
  - British Library http://www.bl.uk/services/documents/authorities.html

Information for the Defense Community

DTIC's Primary Collections

  - No registration; policy available
  - 90,477 public release citations
  - 14227 public release full text

- DTIC Online Access Controlled
  - Registration; validated authorization
    - Citations
    - Public release some full text
    - Unclassified limited; some full-text
    - Unclassified citations to Secret; no full-text

- STINET on the SPRINET
  - Registration; validated authorization

Information for the Defense Community
DTIC’s Primary Collections

- DTIC’s collection contain information that is:
  - Unclassified, Unlimited (UU) (Available for Public Release) 51%
  - Unclassified, Limited (UL) (Unclassified, but sensitive) 40%
  - Classified (through Secret) 9%

Content Repository

- More than 2 million documents in the Technical Reports collection
- More than 300,000 ongoing and completed DoD Research Summaries
- More than 170,000 descriptions of Independent Research & Development projects

Sources of Information

- Defense components
- DoD laboratories
- DoD contractors
- Professionally funded R&D centers
- Unfunded Military service schools
- Other universities
- Other Federal agencies and their contractors
- Foreign governments
- NATO

Types of Information

- Technical reports
- Text metrics
- Studies and analyses
- Journal articles
- Proceedings
- Theses and dissertations
- Patent information
- Planning documents
- Command histories

Research Summaries:
- Overview
- Contracted
- Project details
- Objective
- Approach
- Progress
- Organizational details
- Funding details
- Performing/ Funding agencies and/or author

What Can DTIC Offer YOU?

DoDTechipedia Suite of Services

- DoDTechipedia Limited (unclassified)
- DoDTechipedia Classified
- Aristote Social Networking tool

DefenseSolutions.gov – “Submit a Solution”
Secure Dissemination
DTIC Collection Access

Controlled Secondary Distribution

- DTIC does secondary distribution based on:
  - Classification and distribution statement markings:
    - Document cover, the primary source
    - SF208 Report Documentation Page
  - Matched with User Registration Authorization
- Therefore, all documents and research summaries submitted to DTIC must have a distribution statement.

Where to Submit Documents

Hard Copy (AR-228 & Non-Print (DTIC Form 538):

Defense Technical Information Center (DTIC)
8725 John J. Kingman Rd., Suite 0944
Fort Belvoir, VA 22060
Attn: DTIC-OA

Electronic Documents (AR-228):

Email: TR@dtic.mil
- unclassified/unlimited documents
- TR@dtic.mil (Classified documents)

STINT-TR/EDOC
- unclassified/unlimited & unclassified/confidential documents

Points of Contact

Mr. Willis Smith
Chief, Information Collection Division
(703) 767-8038  DSN 427-8038
wsmith@dtic.mil

Ms. Shari Pitts
Technical Reports Analyst
(703) 767-8037  DSN 427-8037
spitts@dtic.mil

\[\text{Information for the Defense Community DTIC}\]
Appendix G.

Blood Pharming

Dr. Stewart Abbot
Celgene Cellular Therapeutics
Blood Pharming:
Novel technologies for large-scale continuous production of human red blood cells

Stewart Abbott
<stewart@colgene.com>
2010 AFMS Medical Research Symposium

Outline

- Why
  - Drive to manufacture Red Blood Cells (RBC) and other Blood Products
- What
  - Ex vivo recreation of bone marrow "bioreactor"
- How
  - Stem cell and bioreactor details
- When and Where
  - Therapeutic opportunities

US Blood reserve

"Blood Pharming"

Sponsor

Objective
- Continuous production of Universal Donor RBCs in an automated closed culture system using a non-renewing (replaceable) progenitor cell population for treatment of battlefield trauma
Recapitulating Bone Marrow

Ex vivo generation of fully mature human red blood cells from hematopoietic stem cells

- Typical "flask" culture: 
  - ~1.6E6 cells/mL
  - Requires 500 mL to generate 2E12 RBC

- Typical "stirred tank" culture: 
  - ~1E7 cells/mL
  - Requires 500 mL to generate 2E12 RBC

- Typical "hollow fiber" culture: 
  - ~1E7 cells/mL
  - Requires 200 mL to generate 2E12 RBC

Novel Bioreactors

- Hollow fiber bioreactor device contains two different fiber types: 
  - for oxygen/nutrient delivery and waste removal

- Interspersed fibers form an aseptic cell compartment for gas and metabolic exchange

- ~2E4E6 cells/mL

- Requires 4-6 L to generate 2E12 RBC

Bioreactor System

- Pathogen screened CD34+ stem cells
- 30-60 days
- Pathogen-free stable RBC

- CD34+ stem cells from full-term placenta
- Ethically acceptable source
- 4 million live births in US
- Screened for TTD before and tested after birth

Expansion & Differentiation Optimization

- Media Optimization: 
  - ~100 media combinations assessed
  - Screening DOE approach
  - Numerous small scale experiments to few large scale experiments
  - Current best: ~2E6 CD34+ cell expansion with over 100% RBC-like cells
  - Literature best: ~2E5
Compact High Efficiency Bioreactor Module

- Modular small-footprint bioreactor
- Perfusion fluidics facilitate on the fly cell addition and harvest
- Perfusion fluidics facilitate integration of process analytics
- Reactor design supports sustained culture >2x10^6 cells/mL (partially optimized)
- Reactor design supports enhanced maturation of conventional culture
- Linked reactors ensure system redundancy and continuous production

Compact Unit (~30 feet²)

Large-Scale Bioreactor Growth

- Blood Cell Production
- Blood Cell Sorter
- Cell Washing
- Other cells
- CD34+
- Maturing RBC
- Daily RBC produced
- Cumulative RBC produced

Single Bioreactor

Continuous Production System

- Bioreactor 1
- Bioreactor 2
- Bioreactor 3
- Bioreactor 4
- Bioreactor 5
- Daily RBCs from Bioreactors 1-5
- Targeting 50 units/week (~1E14 cells) capacity

RBC Characterization

- CD235, hemoglobin, and maturation, deformability
- CD35 Maturation Marker
- Heterogeneity
- Staining

Stem cell derived “pharmed” red blood cells look and behave like donated red blood cells
Proceedings of the 2010 AFMS Medical Research Symposium
Volume 1  Plenary Sessions and Abstracts

Unique Product Attributes

- Product isolated early in lifespan, stored or stored frozen
- Potential for storage at +4°C
- Highly screened cell lines, population = TTD
- Rapid obtainable and stable population = enhanced logistics
- Campylobacter-free cell lines, population = consistent, high-quality red cells
- Highly scalable downstream processes = enhanced logistics
- Few donors → multiple doses = selected and expanded red blood cells
- Ex vivo expansion and maturation = opportunity for acute genetic modification

Platform Opportunities

- Blood pheresis
  - (Trauma)
  - (Tissue)
  - (Radiation injury)

Phase 1 Lessons and Phase 2 Goals

- Lessons
  - Proof of concept achieved
  - Demonstrated continuous production of human RBCs on a 20L and 200L scale.
  - Developed solutions to all key technical hurdles
  - Relatively high proportions of reticulocytes (slightly immature RBC) in final product
  - Perfusion bioreactor scale to be increased 100x
  - Magnetic separation system throughput to be increased 10x
  - Media and cytokine costs are prohibitive

- Goals
  - Refine system to enable robust clinical-scale and commercial-grade product
  - Optimize system to decrease CCGS by >100x
  - Enhance terminal maturation (erythrocyte → erythrocyte)

Scale-up and Scale-out

- Basic perfusion system fluxes can be scaled to 10,000 mL
- Basic bioreactor design can be scaled from 20L to 200L, without loss of performance
- Perfusion bioreactor optimization to include enhanced PAT
- Perfusion bioreactors operating on 3 sites at 500 mL scale by Q4
- Produced 8 new perfusion systems and 50+ bioreactors in last month
- 100x increase in magnetic sorting throughput by incorporating 2x5 array of longer flow cells
Appendix H.

Mild Traumatic Brain Injury and Sleep

Dr. Michael Russo
Traumatic Brain Injury Neurologist
Sleep, Wake, and Traumatic Brain Injury

COL (R) Michael B Roscoe, MD, FS, FAASM, FACP, FAAN, FAcDA
Medical Director, Pacific Sleep Technology, Honolulu, Hawaii
Associate Clinical Professor of Medicine
John A. Burns School of Medicine, University of Hawaii at Manoa
Adjunct Associate Professor of Neurology
Ecker Jones School of Medicine, Uniformed Services University, Bethesda, Maryland
999-0001-000-000-000 (inf) 201-775-6731 (call)
WAKE REQUIRES FUNCTIONAL NETWORK THROUGH BRAIN

After Trauma
Neurotransmitter pathways desynchronize and fail to maintain wake.
Case: Football Injury

Headache: 1 yr old; right temporal, gliding pain, rolling into posterior neck, tend to sever intensely.
- All-day, every day since most injury.
- Dizziness, photophobia, nausea, vertigo.
- Dementia; improved with intravenous
  Exemestane.
Sleep:
- Orthopaedic setting setup
  “Diabetes.”
- Some tendency awakening in sleep.
  Thorax and lungs:
- Sleepy and opioid only.
- Ate twice or less per day.
Neurological exam:
- Normal.
Brain CT: Normal.

differential Diagnosis:
- Headache: primary vs. secondary. Allogenic
  mening, nuchal muscle, muscle, coccis, subarachnoid?
- Insomnia—psychophysical?
- Osteoarthrosis—sleep apnea?
- Other: Sleep apnea (apnea), cardiac: Sleep disorient, diabetes, sleep apnea?
- Hypoxia:
  - Sleep deprivation, post-traumatic
  sleep apnea.
- TBI Type? - Based upon available info:
  - LOC: 1 hr
  - CBT: Mild
  - Hospitalization:
  - None
  - HPI:
    - Normal
  - CT scan: Normal
  - Mild TBI

Case: Football Injury

MRI Imaging shows white matter lesions in premedial areas and right frontal lobe.

Cerebral Polysomnography:
- AHt: 34 w/ debris to 85%
- MSLT shows sleep onset latency of 5 min, no Sleep-stimulated REM

Diagnoses:
1. Moderate TBI.
2. Post-Insomia: Obstructive Sleep Apnea.
3. Sleep Deprivation-related daytime sleepiness.
4. Insomnia: T-B dobradpis/physiologic?
   type of sleep-sindist

- Apnea/Hypopnea Index: Number of breathing event per hour
  - OSA: Mild (5-14), Moderate (15-30), Severe (30+)
Brainstem lesions may interrupt respiratory nuclear groups in Post-traumatic Sleep Apnea

Panels: Respiratory-modulated cells signal the medullary rhythm and pons generator cells.

Medulla (upper): Bronchial and muscular passive respiratory and signal descending inspiratory and expiratory pathways.

Medulla (lower): Major respiratory pump muscles, nuclear clusters control diaphragm and intercostals.

These brainstem respiratory nuclear groups form a network that ensures reciprocal activations and inhibits the respiratory cycle susatiation.

Treatment Pearls

On-the-field trepanation: Remove the helmet first!

Prevention is the best treatment

Benchwarmers have fewest injuries

Trepanation

19 y/o boxer: Inability to sleep for 6 months.
- Trauma: assault, stranger, road accident.
- Naps of 15-30 minutes, bizarre dreams.
- 3-concussive, severe TBI, CCR.

Neuro exam positive: Hyporeflexia, hypopharynx:
- Head: CT axial scan, normal
- Differential: Seizure, TBI, metabolic ( intoxication, hypoxia, etc.,)

Case Discussion: The Boxer

102
The Boxer - work-up

- Overnight polysomnography:
  - No snoring / Hypopneas

- Multiple Sleep Latency Test
  - Latency is long:
    - 3 Sleep Onset REMs

- Diagnosis:
  - Post-traumatic narcolepsy

Boxer’s MRI mimics Multiple Sclerosis but w/u for MS negative

Some pharmacologic treatments for post-traumatic narcolepsy

- Sodium oxybate (Xyrem®) rapid induction of slow sleep used to treat narcolepsy

- Modafinil (Provigil®) - 150-300 mg open-awakening

- Amantadine (Symmetrel®) - 200 mg open-awakening

- Electrosensitometry (Dexedrine®) - 30 mg open-awakening

Dementia Pugilistica

- Pathology similar to Alzheimer’s

- Quarry dead at 53: “last fight of his life”
- Post-mortem findings

- The NDA’s: TIA despite Sodexo’s safety campaign
- The Boxer’s battle against deconditioning

- Natural death: multiple causes of trauma - blunt force trauma, hypoxic-ischemic encephalopathy, cerebral contusion, diffuse axonal injury, subdural hematoma, and brainstem hemorrhage

- Automatic external defibrillator (AED) not deployed at scene of death

- The Boxer’s final fight

- The NDA’s: TIA despite Sodexo’s safety campaign
- The Boxer’s battle against deconditioning

- Natural death: multiple causes of trauma - blunt force trauma, hypoxic-ischemic encephalopathy, cerebral contusion, diffuse axonal injury, subdural hematoma, and brainstem hemorrhage

- Automatic external defibrillator (AED) not deployed at scene of death

- The Boxer’s final fight
Proceedings of the 2010 AFMS Medical Research Symposium
Volume 1  Plenary Sessions and Abstracts

Treatments of Dementia Pugilistica

- Cognitive disorder: rivastigmine (Exelon), donepezil (Aricept), galantamine (Razadyne).
- Acetylcholinesterase inhibitors increase available acetylcholine to neurons and site.
- Hypothesis that this happens neurone shrinkage.

- 8% marked improvement, 26% mild to no improvement

Novel Non-pharmacological treatments for TBI-Related Insomnia

- Often resistant to conventional therapies.
- Sleep hygiene, CBT, monotherapy:
  - Virtual Reality (V-Real) Audio Sleep Training
    - mask loud and exciting, then
    - steady w~chaw down over 30 minutes

  - Treatment of insomnia with virtual reality audio sleep training vs cognitive behavioral therapy: a randomized controlled trial.

  - Treatment of insomnia with virtual reality audio sleep training vs. cognitive behavioral therapy: a randomized controlled trial.


Monotherapy vs. polypharmacy

Pharmacological Procedures and Dosages of Some Hypnotic Drugs Used in the Treatment of Insomnia

- Polypharmacy
  - start with zolpidem (150 or 100mg) nightly evening to induce sleepiness, then at bedtime:
    - zopiclone (Stilnox) 10mg or
    - estazolam (Luminal) 3mg or
    - zaleplon (Sonata) 10mg

- If sleep maintenance is a problem, temazepam (Restoril) 30mg or
- zopiclone extended release (Stilnox OR 12,5mg)

Case: The Blast

- Brain CT after injury showed:

- 39gm aviation response to 60I (ft) level
  - LOC for 15-30 min level
  - Diffusion changes seen in left parietal, occipital, and lateral regions
  - Diffusion changes seen in left parietal, occipital, and lateral regions
  - Diffusion changes seen in left parietal, occipital, and lateral regions
  - Diffusion changes seen in left parietal, occipital, and lateral regions

- Mental Status: alert, oriented, normal memory, somewhat amnestic

- Mental Status: alert, oriented, normal memory, somewhat amnestic
Case: The Blast

- Overnight Polysomnography
  - No hypoxemia
  - No apneas
- Multiple Sleep Latency Test
  - Sleep onset latency: 6 mins
  - No Sleep Onset REMs
- EEG
  - Normal
- 72 hour EEG monitoring:
  - Right hemispheric left and right frontal regions
  - Seizures present during transition from N1 to N2 sleep
  - Patient unaware of seizures

Sleep Seizures in TBI

- Seizures during sleep most frequently arise from non-REM, specifically stage N2. Partial seizures arise from extratemporal foci in related train.

Post-Traumatic Seizures during Sleep

- Nocturnal seizures most common in Sleep Stage N2
- 97% of TBI patients developing Post-Traumatic Epilepsy have at least one seizure within 5 years of injury
- TBI seizures occur within the first week after injury or early seizures, then an increase in the incidence of late epilepsy has been observed

Percentage of partial seizures during non-REM sleep stages

- Chart shows percentage of partial seizures in different sleep stages.
- NREM stages are indicated on the x-axis, and the percentage of seizures on the y-axis.

Sleep Seizures in TBI

- Partial seizures may go undetected and are a cause of fragmented sleep and daytime sleepiness.
Pharmacological Treatments for Partial Onset Seizures

Anticonvulsants in TBI

- New AEDs have fewer side effects
- Tiagabine, levetiracetam, valproic acid, lamotrigine, pregabalin have good efficacy
- Tiagabine, gabapentin, pregabalin have positive effects on sleep

AED Effects on Sleep Architecture and Complaints

Anticonvulsants

- Tiagabine: SU (Suicide) - effects on sleep architecture and sleep spindle activity. Used in patients with partial onset seizures and myoclonus. Can cause dizziness, fatigue, and cognitive difficulties. May also cause anxiety and agitation. Can reduce sleep spindles, which are important for memory consolidation.

- Levetiracetam: SU (Suicide) - effects on sleep architecture and sleep spindle activity. Used in patients with partial onset seizures. Can cause dizziness, fatigue, and cognitive difficulties. May also cause anxiety and agitation. Can reduce sleep spindles, which are important for memory consolidation.
Tiagabine (Gabitril)

- Efficacy: Tiagabine has been shown to be effective in the treatment of focal seizures, with a dose range of 10-20 mg/day.
- Adverse effects: Common side effects include dizziness, headache, and fatigue. Rare side effects include skin reactions, liver dysfunction, and psychiatric disturbances.
- Dosage: Starting dose is 10 mg/day, increased gradually to a maximum of 20 mg/day.

Lamotrigine (Lamictal)

- Mechanism of action: Lamotrigine is an anticonvulsant that decreases neuronal excitability in the brain.
- Dosage: Initial dose is 25 mg/day, increased gradually to a maximum of 100-200 mg/day.
- Adverse effects: Common side effects include rash, headache, and dizziness. Rare side effects include skin reactions, liver dysfunction, and psychiatric disturbances.

Sleep, Wake, and Traumatic Brain Injury

- Sleep disturbances are common after traumatic brain injury, affecting both sleep quantity and quality.
- Treatment options include sleep hygiene education, medication therapy, and behavioral interventions.

Galantamine

- Indications: Treatment of Alzheimer's disease, mild cognitive impairment, and organic amnestic syndrome.
-dosage: Initial dose is 4 mg/day, increased gradually to a maximum of 8 mg/day.
- Adverse effects: Common side effects include nausea, vomiting, and diarrhea. Rare side effects include skin reactions, liver dysfunction, and psychiatric disturbances.
**donepezil**

- **DOSAGE**: Adult: 10 mg OD
- **DRUG CLASS AND MECHANISM**: Donepezil is a cholinesterase inhibitor. It enhances cholinergic neurotransmission by inhibiting the metabolism of acetylcholine, thereby increasing the availability of acetylcholine for synaptic transmission. The drug is orally active and is metabolized in the liver, with approximately 80% of the drug being excreted in the urine and 10% in the feces.
- **PROPHYLAXIS**: Donepezil is associated with a small but significant increase in the risk of gastrointestinal adverse effects, including diarrhea, nausea, and vomiting. It should be administered with food to reduce these effects. In case of overdose, supportive care and decontamination are recommended.
- **SIDE EFFECTS**: Common side effects include nausea, vomiting, diarrhea, headache, and dizziness. Rarely, patients may experience confusion, agitation, or hallucinations. In patients with dementia, the risk of worsening cognitive function should be considered.

**rivastigmine**

- **DOSAGE**: Adult: 12 mg OD
- **DRUG CLASS AND MECHANISM**: Rivastigmine is a cholinesterase inhibitor similar to donepezil in its mechanism of action. It is used to treat moderate to severe dementia, particularly Alzheimer's disease. Rivastigmine is also available in a transdermal patch formulation.
- **PROPHYLAXIS**: Rivastigmine is associated with a low incidence of gastrointestinal adverse effects, including nausea, vomiting, and diarrhea. It should be administered with food to reduce these effects. In case of overdose, supportive care and decontamination are recommended.
- **SIDE EFFECTS**: Common side effects include nausea, vomiting, diarrhea, headache, and dizziness. Rarely, patients may experience confusion, agitation, or hallucinations. In patients with dementia, the risk of worsening cognitive function should be considered.
Appendix I.

Defense Centers of Excellence (DCoE)

Dr. George Johnson
TBI Directorate
DCoE TBI Research Role & TBI Research Gaps

26 August 2010

Overview

- DCoE Research Directorate Mission/Activities
- DCoE Research Directorate Output/Impact
- Research Coordination
- Summary of Funded DoD Research
- TBI Research Initiatives
- TBI Research Goals
- TBI Research Questions
- TBI Research Emphases

DCoE Research Function
Mission/Activities

Mission:
- To support and promote research and systematic analyses in Psychological Health and Traumatic Brain Injury to improve the health and wellness of military personnel and their families

Activities:
- DCoE does NOT fund research, but advises DoD on investment strategy
- Lead the advancement of PH/TBI knowledge by strategically managing research
- Foster collaborations and partnerships

Outputs:

- DCoE personnel contribute to the DoD Research Gap Analyses, Broad Agency Announcements, Product Line Reviews, Information Papers, Program Evaluation Reports
- All developed in collaboration with partners

Impacts:
- Target specific gap areas for maximum impact
- Reduce duplication of effort
- Transition the most promising research into practice
DCoE Research Coordination

- Armed Services Biomedical Research Evaluation and Management Committee
  - Facilitate coordination and prevent unnecessary duplication of effort within DoD biomedical research and development
  - Defense Health Program Medical Research & Development Office, FHPAR
  - Develop R&D planning, programming, budgeting, and execution (PPBER) strategies
  - Communicate PPBER guidance to organizations utilizing DoD RDT&E funds
  - Fiscal point for all DoD medical R&D actions and communications
- Joint Programming Committees (JPCs)
  - Provide input into funding requirements by functional areas, TBI spread over several different JPCs
  - Representatives from the Services, VA, NIH, OASD(HA), DARPA, and DCoE
  - Same groups used for Programmatic Reviews of research proposals

DoD Funded TBI Research Epidemiology

- Incidence
- Natural History
  - Neuropsychological Functioning
  - Symptoms
  - Effects on Emotion
  - Effect of Hypoxia in Aviators Following TBI
- Predictors of Recovery
  - Epigenetic Patterns

DoD Funded TBI Research Neuroprotection

- Small Molecule Activators
- Xenon
- Progesterone
- Neuroprotection Following Repetitive TBIs
- Biological Regulation of TBI

DoD Funded TBI Research Assessment/Diagnosis

- Fitness for Duty Testing
- ANAM validation/improvement
- Neurobehavioral Assessments
- Biochemical Markers
- Field Portable Devices for Diagnosis
- Neuroimaging
  - Functional MRI
  - High Resolution Diffusion Tensor Imaging
  - Defining Neuroimaging Functional Thresholds
DoD Funded TBI Research Treatment

- Zinc Supplementation
- Omega 3 Fatty Acids
- Antinflammatory Drugs (NNZ-2566)
- Glyburide
- Ganaxalone
- Nitroxide Resuscitation
- Treatment of Silent Seizures
- Hyperventilation
- Hyperbaric Oxygen
- Acupuncture

DoD Funded TBI Research Recovery/Rehabilitation

- Electrical Stimulation to the Midbrain
- Stem Cell Tissue Engineering
- Brain Tissue Regeneration
- Repetitive Transcranial Magnetic Stimulation
- Interactive Virtual World Environments

Gap Summary Sources

- Defense Health Program, Strategic Review and Analysis, 27 JULY 2010
  - Joint Program Committee for Military Operational Medicine (JPC-5)
  - Joint Program Committee for Combat Casualty Care (JPC-6)
  - Joint Program Committee for Clinical and Rehabilitative Medicine (JPC-8)

TBI Research Initiatives

- Develop standardized outcome measures that can be integrated into clinical testing to provide better outcome assessments between different studies
  - 2008 – DoD facilitated common data elements effort w NINDS, VA and NCoE
  - Established Working Groups – wrote manuscripts
  - Manuscripts submitted to the Archives of Physical Medicine and Rehabilitation for publication
- Collaborate to promote a common repository to collect data.
  - Obtain databases developed from the field (need to address data piping of data within JTAPIC and services)
TBI Research Initiatives (Cont)

- Promote methods to put clinicians & scientists on the ground in theater for the following research:
  - Feasible Imaging (US, CT, TCD)
  - Physiology (EEG, eye tracking, pupillometry, NIRS, EP)
  - NCAT
  - Serum/CSF/urine biomarkers on the ground
- Would provide better case definitions and answer many questions about mild TBI due to blast injury

TBI Research Goals

- Validate early management of cerebral vasospasm with hypothermia, stent and calcium channel blockers
- Validate hypothermia as acute management strategy in CNS trauma
- Develop guidelines and methods for safety heating/cooling
- Develop fieldable and man portable diagnostic and monitoring systems
- Complete biomarkers pivotal trial and translate all 3 blocks to military use
- Improve pain management in all severities of TBI and assess impact of appropriate pain mgmt on incidence of TBI plus PTSD
- Expand studies utilizing regenerative medicine approaches for Treatment of mild/severe/penetrating TBI

TBI Research Questions

- How does mild TBI progress from acute injury to persistent symptom?
- What are the consequences of multiple concussions in regards to the development of chronic traumatic encephalopathy?
- What is the effect of hypotensive resuscitation, shock, and temperature on neurotrauma?
- What is the effect of G forces, hypobaria and other air evacuation related risk factors on patients with neurotrauma?
- What is the utility of HBOT for moving neurocasualties and other severe casualties via air evacuation?
- What is the utility of perfluorocarbons and acellular hemoglobin for moving neurocasualties and other severe casualties via air evacuation?

TBI Research Emphases

- Place more emphasis on TBI and PH prevention studies/studying active duty service members
  - Address issue of limited subjects-good for the Warfighter but bad for the pending research
- Partner with NIH and VA on large clinical trials and prepare joint applications for proposals
  - Develop pan-federal TBI patient data repository
  - Conduct TBI Comparative Effectiveness Research
  - Conduct combination therapy trials for TBI
- Develop evidence based, guideline driven cognitive, behavioral and motor rehabilitation strategies
TBI Research Emphases (Cont)

- Request studies that use human studies of blast injury patients, compare with known impact samples
  - Work toward better validated models of head impact through use of detailed imaging
  - Cross-correlate existing and classified databases on blast events, medical reports of those casualties, sensor data from helmets – use findings to refine animal models.
- Promote studies of a helmet sensor for the field that captures both pressure and acceleration, and works reliably and consistently
- Promote longitudinal studies that start in theater with the TBI event and follow people forward with appropriate controls, other injured individuals, etc.

George P. Johnson, MD
Chief, TBI Consultation Division
Defense Centers of Excellence for Psychological Health and Traumatic Brain Injury
garrisonjohnson@bpc.osd.mil
(301) 295-8333
Appendix J.

Simulation Training

Research-Trauma Man

Capt Andrew Hall

81 MDG
## Medical Readiness: Animal Training in the age of Simulation

Capt. Andrew B. Hall, USAF MC
81st MSGS/SGCQ

### Overview

- Emergency Medical Needs
- Animal Training
- Simulator Training
- Conclusions
- Current and Future Research

### Emergency Medical Needs

- Military Medicine Requirements:
  - Well trained initial responders and definitive care providers able to perform life saving procedures in potentially austere and complex conditions
Animal Training

- Benefits:
  - Real tissues, bleeding, and effects
- Disadvantages:
  - Cost of upkeep (Facilities and Staff)
  - Ethical concerns

Animal Training

- Requirements:

Simulator Training

- Benefits:
  - Controllable variation
  - Low cost of upkeep (Dedicated facility and staff not required)
  - No ethical concerns
- Disadvantages:
  - Lack of exact tactile sensation
  - Lack of real consequences
  - Lack of detailed anatomy
### Simulator Training

- Images of medical training equipment and simulators.

### Current Research

- **Limited analysis comparing outcomes of animal and simulator training**
  - Historical research based on subjective analysis and opinion and most test to just see if simulation works.
  - Block S, et al. 2002: 3.64/5 on satisfaction survey for simulation of emergency procedures.
  - Sutherland, L. et al. 2006: No significant differences found between studies testing training methods (nearly all comparing computer/AV/no training).
  - Lynch J, et al. 2007: Literature review: 70% of studies found improvement in procedural skill.

---

### Current Research

- **Direct comparison to human outcomes difficult**
  - Unethical to randomize trainees and test performance in emergency situations where lives are at stake.

- **81st TRW medically naive volunteers trained on animal model (pig) and TraumaMan simulator**

- **7 days post training objectively assessed on fresh human cadavers**
Conclusions

- Trends indicate improved outcomes after animal training for cricothyroidotomy. No obvious trends for improvement in chest tube performance.
- Improved confidence/self-efficacy may be important in battlefield results. Further evaluation needed.

Future Research

- Multi-center trial with standardized simulator/animal training with cadaver comparison
- Other Simulators
  - 140 subject randomized comparison of ultrasound guided venous access simulator compared to animal training with pre and post self-efficacy evaluation

Bibliography


Questions?
Appendix K.
Joint Technical Coordinating Group (JTCG) Updates
Col Ray Santullo
Air Force Liaison to JTCG
Headquarters U.S. Air Force

AFMS JTCG/JPC Update

26 Aug 2010
Ray F. Santullo, Col, USAF, BSC
AFMS Liaison to JTCG
Assistant to Secretariat ASBREM

Overview

- Disclaimer
- Defense Medical Research Program (DMRDP)
- Joint Technology Coordinating Groups (JTCG) and Joint Program Committees (JPC)
- DHP Funded AFMS Research
- How to Get There From Here

---

Defense Medical Research and Development Program (DMRDP)

LEGISLATIVE MANDATES
Sec. 299 - Prevention, Mitigation, & Treatment of Blunt Injuries

Sec. 723 - Longitudinal Study on Traumatic Brain Injury
Sec. 781 - Pilot Projects on Early Diagnosis & Treatment of Post Traumatic Stress Disorder & Other Mental Health Conditions

Title XVI - Wounded Warrior Matters
Center of Excellence in the Prevention, Diagnoses, Mitigation, Treatment & Rehabilitation of Traumatic Brain Injury, Post Traumatic Stress Disorder & Polytrauma

Guidance for Development of the Force (GDF)

<table>
<thead>
<tr>
<th>Functional Area</th>
<th>Gap Status (Number of Gaps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joint Human Performance Enhancement</td>
<td>-</td>
</tr>
<tr>
<td>Joint Health Surveillance, Intelligence &amp; Preventive Medicine</td>
<td>-</td>
</tr>
<tr>
<td>Joint Casualty Management</td>
<td>1</td>
</tr>
<tr>
<td>Joint Patient Movement</td>
<td>-</td>
</tr>
<tr>
<td>Joint Medical Logistics &amp; Infrastructure Support</td>
<td>-</td>
</tr>
<tr>
<td>Joint Theater Medical Command &amp; Control</td>
<td>-</td>
</tr>
</tbody>
</table>

---

122
Proceedings of the 2010 AFMS Medical Research Symposium
Volume 1
Plenary Sessions and Abstracts

Year of the Air Force Family

Types of RDT&E Money

- 6.1 Basic Medical Research - obtaining greater knowledge and understanding of fundamental principles of science and medicine
- 6.2 Applied Biomedical Technology - refinement of concepts and ideas into potential solutions with a view toward evaluating technical feasibility
- 6.3 Medical Technology Development - development of candidate solutions and components of early prototype systems for test and evaluation, including support of early stage clinical trials
- 6.4 Advanced Component Development - concept for FDI licensed products and accelerated transition of FDI regulated products and medical practice guidelines to operational users through clinical and field validation studies
- 6.5 Medical Systems Development - development of demonstration of medical concepts prior to initial full-scale production and fielding, including initial operational test and evaluation and clinical trials
- 6.6 Management Support - infrastructure and civilian salary support
- 6.7 Medical Systems Evaluation Activities - preclinical and post clinical evaluation of candidate medical products and evaluation of the effectiveness of existing products, therapies, treatments or medical practices

Year of the Air Force Family

Joint Program Committees

- Armed Services Biomedical Research Evaluation Management Committee
- OASD/Force Health Protection & Readiness
- JTCGs
- MRMIC
- DMROP

Joint Research Task Area

Joint Program Committees

Year of the Air Force Family

JTCG Organization

- Armed Services Biomedical Research Evaluation Management Committee

JTCGUPC Chair AFMS Rep
1 - Bio and Medical Informatics Dr. Karl Fried (USAMRMC) Col. Dino Bongiorno (AFIT/DS)
3 - Military Operational Medicine Col. Carl Cavero (USAMRMC) Maj. David Kanes (711THP)
4 - Combat Casualty Care Capt. David Mack (USAMRMC) Maj. Charles Tippins (711THP)
5 - Radiation Health Effects Capt. Patricia Allerton (USAMRMC) Maj. Michael Williams (711THP)
6 - Chemical, Biological, and Radiation Col. Joseph Murrey (USAMRMC) Maj. Keith Smith (711THP)

Year of the Air Force Family

JTCG Research Tasks

- JTCG 1 - Medical Informatics
  - Health information technology
  - Computational resources related to organization, development, training, and distribution of medical knowledge
- JTCG 2 - Military Infectious Diseases
  - Microbiology
  - Biotechnology
  - Pathways of infection and drug-resistant antibiotics
- JTCG 3 - Military Operational Medicine
  - Injury prevention and reduction
  - Psychological health and resilience
  - Physiological health
  - Environmental health and protection

Integrity - Service - Excellence

Integrity - Service - Excellence

123
FY 10 DHP Funded AFMS Research Projects

<table>
<thead>
<tr>
<th>Type</th>
<th>Title</th>
<th>PI</th>
</tr>
</thead>
<tbody>
<tr>
<td>NTR</td>
<td>Joint Operational Training for the Care of Temporary Vegetative Status</td>
<td>Dinko</td>
</tr>
<tr>
<td></td>
<td>Military Survivors in the Management of Non-Compliant Care Recipients</td>
<td>Rauchman</td>
</tr>
<tr>
<td>CRI</td>
<td>Characterization of the Human Proteomic Response to Hydrocortisone</td>
<td>Li Col Bettoni</td>
</tr>
<tr>
<td>CRI</td>
<td>Investigation of Chronic Pain Following Traumatic Injury</td>
<td>Maj Chiarini</td>
</tr>
<tr>
<td>CRI</td>
<td>Determination Physiological and Behavioral Correlates of 90-Day Brain</td>
<td>Dr Poulin</td>
</tr>
<tr>
<td></td>
<td>Injuries in Survivors of Moderate to Severe Traumatic Brain Injury</td>
<td></td>
</tr>
<tr>
<td></td>
<td>and Improve Neurocognitive Outcomes in Trauma-Related Medicine</td>
<td></td>
</tr>
<tr>
<td></td>
<td>with Mild/Moderate Trauma TBI</td>
<td></td>
</tr>
<tr>
<td>SOR</td>
<td>Synthetic Tissue Trainer</td>
<td>Mr. Wei</td>
</tr>
<tr>
<td>SOR</td>
<td>Medical Gaming</td>
<td>Mr. Wei</td>
</tr>
</tbody>
</table>

AFMS Modernization Thrust Areas

<table>
<thead>
<tr>
<th>Force Structure Transformation</th>
<th>Mission Area of Focus</th>
<th>AFMS Operational Medicine</th>
<th>AFMS Portfolio</th>
<th>AFMS Health Informatics</th>
<th>AFMS Operational Medicine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Military Health Transformation</td>
<td>Military Health</td>
<td>Military Health</td>
<td>Military Health</td>
<td>Military Health</td>
<td>Military Health</td>
</tr>
<tr>
<td>Medical Science</td>
<td>Medical Science</td>
<td>Medical Science</td>
<td>Medical Science</td>
<td>Medical Science</td>
<td>Medical Science</td>
</tr>
<tr>
<td>Operational Technology</td>
<td>Operational Technology</td>
<td>Operational Technology</td>
<td>Operational Technology</td>
<td>Operational Technology</td>
<td>Operational Technology</td>
</tr>
<tr>
<td>Enabling Technologies</td>
<td>Enabling Technologies</td>
<td>Enabling Technologies</td>
<td>Enabling Technologies</td>
<td>Enabling Technologies</td>
<td>Enabling Technologies</td>
</tr>
</tbody>
</table>

If you’re not at the table you’re on the menu...Engage
Spend your funds early and often...Know the rules
Operate as a symphony not a solo act...See the big picture
Continuity...Avoid critical points of failure
Focus on military relevance and avoid unnecessary duplication...AF-specific programs should be core AF funded
What is the deliverable...Your Quad sells your proposal
Past performance...Speak to your success
Portfolio balance...Deconflict/enhance existing programs
Demonstrate active management of portfolio...Be worthy
Enabling support to execution platforms
Translation/transition plan?
### FY 10 DHP Funded AFMS Research

<table>
<thead>
<tr>
<th>Type</th>
<th>Projects</th>
<th>FY10 $K</th>
<th>FY11 $K</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1</td>
<td>2</td>
<td>$178.0</td>
<td>$329.0</td>
</tr>
<tr>
<td>6.2</td>
<td>1</td>
<td>$109.9</td>
<td>$301.9</td>
</tr>
<tr>
<td>6.3</td>
<td>1</td>
<td>$5,161.1</td>
<td>$8.0</td>
</tr>
<tr>
<td>6.4 Adv Devices</td>
<td>4</td>
<td>$1,484.9</td>
<td>$1,084.4</td>
</tr>
<tr>
<td>6.4 Hemorrhage</td>
<td>1</td>
<td>$5,858.9</td>
<td>$1,468.0</td>
</tr>
<tr>
<td>6.4 Medical IM/IT</td>
<td>2</td>
<td>$2,381.2</td>
<td>$9.0</td>
</tr>
<tr>
<td>CBS/TPH</td>
<td>3</td>
<td>$2,555.0</td>
<td>$851.0</td>
</tr>
<tr>
<td>6.7</td>
<td>2</td>
<td>$324.9</td>
<td>$338.0</td>
</tr>
<tr>
<td>MBIR</td>
<td>2</td>
<td>$208.8</td>
<td>$8.0</td>
</tr>
<tr>
<td>Totals</td>
<td>16</td>
<td>$16,298.7</td>
<td>$4,407.8</td>
</tr>
</tbody>
</table>

### FY 2010 RDT&E Budget

**Defense Health Program**

**FY 2010 RDT&E Budget Estimates**

<table>
<thead>
<tr>
<th>Description</th>
<th>FY 2010 Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-House Laboratory Independent Research (L3, L7, L9)</td>
<td>(0.5, 0.7, 0.9)</td>
</tr>
<tr>
<td>Basic Operational Medical Research Sciences (558.72M)</td>
<td></td>
</tr>
<tr>
<td>Applied Biomedical Technology (552.64M)</td>
<td></td>
</tr>
<tr>
<td>Medical Technology (31.41M)</td>
<td></td>
</tr>
<tr>
<td>Medical Advanced Technology (50.77M)</td>
<td></td>
</tr>
<tr>
<td>Medical Development (115.31M)</td>
<td></td>
</tr>
<tr>
<td>Medical Products Support/Advanced Concept Development (999.61M)</td>
<td></td>
</tr>
<tr>
<td>Information Technology Development (924.41M)</td>
<td></td>
</tr>
<tr>
<td>Medical Products &amp; Support Systems Development (81.83M)</td>
<td></td>
</tr>
<tr>
<td>Small Business Innovative Research Programs (83.000M)</td>
<td></td>
</tr>
<tr>
<td>Medical Products &amp; Capabilities Enhancement Activities (263.900M)</td>
<td></td>
</tr>
<tr>
<td>TOTAL ($1.0B)</td>
<td></td>
</tr>
</tbody>
</table>