Military Operational Medicine Research Program: Joint Program Committee-5

CDR Christopher T. Steele

MOMRP Director, JPC-5 Chair

15 MAY 2019

MOMRP Director Roles…

Programming, Planning, Budgeting and Execution management (PPBE):

drive extramural grant/contract funding

1) Program Area Director for Army funding in Operational Medicine (Army 6.1-6.3 ASA/ALT funding)

2) Joint Program Committee Chair in Operational Medicine (DHA 6.1-6.3 funding)

support intramural efforts and workforce

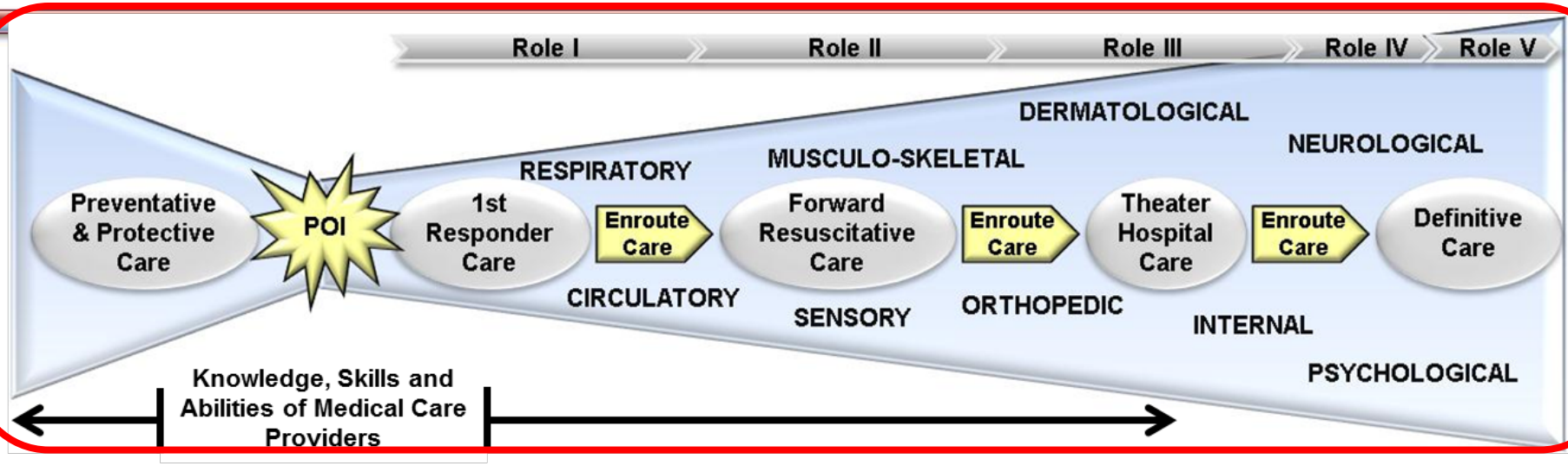
3) Government Steering Committee Chair for two (PTSD, Suicide) consortiums

Coordinate across the services and provide senior leader visibility:

engage across services

4) Joint Technology Coordination Group Chair in Operational Medicine ("ASBREM" Biomedical Community of Interest role)

Scope of Medical Research
Operational View-1



MOMRP Scope

BLUF: Outside of Battlefield Care, Medical RDT&E also supports:

1. **Physiological basis for Warfighter optimization and enhancement**
2. **Mental/cognitive resilience**
3. **Injury prevention**
4. **Rapid reset/return to duty**
5. **Exposure standards for safe exposures and effective PPE design**
6. **Countermeasures to operational stressors**

DoD Biomedical Funding by Focus Areas

Medical

Medical Simulation and Information Systems (MSIS)
Medical Chemical and Biological Defense (MCBD)
Combat Casualty Care (CCC)
Military Infectious Diseases (MID)
Medical Radiological Defense (MRD)
Military Operational Medicine (MOM)
Clinical & Rehabilitative Medicine (CRM)

Human Systems

Human Systems Interfaces
Manpower, Personnel and Training
Performance Sustainment

Approved for Public Release: Distribution A: Distribution Unlimited, ONR 13JUN2014 Case No. 43-358-14

US Army Medical Research and Development Command (MRDC)

Commanding General

Deputy Commander

Deputy Commander Special Staff
- Dir, Office of Small Business Prog
- Dir, Office of Research Protections
- Dir, Quality Management
- International Affairs Officer
- Strategic Partnerships Office

Other Organizations
- Congressionally Directed Medical Research Programs (CDMRP)
- Telemedicine and Advanced Technology Research Center (TATRC)

Command Sergeant Major

Commanding General Special Staff
- Inspector General
- Principal Assistant Resp. for Contracting
- Staff Judge Advocate
- Equal Opportunity Advisor
- Safety Office
- SARC/SHARP

Chief of Staff

Secretary of the General Staff

Chief of Staff Special Staff
- Dir, Med Systems Office, ASAALT
- Dir, Plans, Programs, Analysis, & Eval
- Dir, Materiel
- Dir, Surety & Environmental
- Internal Review
- Protocol Officer
- Public Affairs Officer
- Enlisted Senior Career Counselor
- Transformation Officer

Deputy Chiefs of Staff
- DCS, Human Resources (G1)
- DCS, Operations (G3)
- DCS, Logistics (G4)
- DCS, Info Mgmt / Info Tech (G6)
- DCS, Resource Management (G8)

Principal Assistant for Research and Technology
- Dir, Infectious Diseases
- Dir, Combat Casualty Care
- **Dir, Military Operational Medicine**
- Dir, Clinical & Rehabilitative Medicine
- Dir, Medical Simulation and Information Sciences
- Dir, CBRN Defense MedRsch Coordination Office
- Dir, Blast Injury Rsch Pgm Coordinating Office
- Joint Trauma Analysis & Prev of Inj in Combat (JTAPIC)

Principal Assistant for Acquisition
- Pharmaceutical Systems
- Medical Support Systems
- HIV Vaccine
- Armed Forces Inst of Regen Medicine
- Hyperbaric Oxygen
- Medical Devices
- Integrated Clinical Systems
- Helicopter Medevac Med Equip Pkg
- USAMRMC Enterprise IM/IT
- Neurology and Psych Health

MOMRP Overview

MOMRP portfolio serves to ensure Service members are

responsive to the challenges of training
resilient to the rigors of combat
resistant to longitudinal stressors

- Develops capabilities to prepare for the fight and stay in the fight
- Enables Service members to overcome external and internal stressors
  - *External factors* include heat, blast and repeated impacts (operating weapons systems, physical injury)
  - *Internal factors* are both physiological and psychological

MOMRP Overview

This portfolio develops solutions to:

- prevent injury and performance degradation,

- sustain & improve performance in complex operating environments, and

- treat detrimental conditions

- ***Medical Readiness*** efforts impact the potential of the Warfighters through Preparation/Prevention

- ***Biomedical Performance*** drives lethality of the force through Sustainment and Optimization

MOMRP
Mission and Portfolios

Develop effective biomedical countermeasures against operational stressors and to prevent physical and psychological injuries during training and operations in order to maximize the health, readiness and performance of Service members and their Families, in support of Multi-Domain Operations, Army CFT and SECDEF Lethality Priorities, and Human Performance Optimization & Enhancement and DoD Total Force Fitness concepts.

JROC approved Joint Military Operational Medicine Initial Capabilities Document, NOV 2018

Science

ENVIRO
Environmental Health and Protection

THREATS

- Heat/Humidity Stress
- Dehydration
- Cold Stress
- Dust/Air Pollution
- Toxic Industrial Chemicals/Materials
- Water Contaminants
- Altitude & Undersea Hypoxia

INJURY
Injury Prevention and Reduction

THREATS

- Musculoskeletal Injury
- Blast Overpressure
- Blunt Head/Body Trauma
- Face/Eye/Spinal Injury
- Acoustic Trauma
- Directed Energy Injury
- Degraded Visual Environment

PHYSIO
Physiological Health and Performance

THREATS

- Disaggregated/Continuous Operations
- Sleep Deficit and Circadian Desynchrony
- Sustained Fatiguing Work (Physical/Mental)
- Malnutrition
- Dietary Supplements Misuse

PSYCH
Psychological Health (PH) and Resilience

THREATS

- PTSD/Other PH Disorders
- Suicide Behavior
- Alcohol/Other Drug Use
- Co-occurring Mental Disorders
- Access/Retention in Behavioral Health Care
- Family Transitions and Well-being

- MILCOHORT Epidemiology Efforts
- Biomedical Performance Enhancement
- Wearables for Health, Readiness and Performance

Service Member

CDR Christopher T. Steele, Director, christopher.t.steele3mil@mail.mil, 301-619-7304

MOMRP Solutions Across the Military Lifecycle

Developing and Maintaining a Ready and Resilient Force

Re-Deployment

Treat Casualties

Deployment/ Employment

- Performance optimization in the context of MOS
- Physical & cognitive load

Reset

- Return to duty standards & criteria

Post-Deployment

Mobilization/ Pre-Deployment

Reconstitution

- Human Systems Integration
- Training technology

K-12 thru Accession

Basic Training/Advanced Individual Training

Readiness

Separation

Post-Military Surveillance

- Accession standards & strategies to predict retention
- Assessment of potential

- Women in combat/gender-specific vulnerabilities

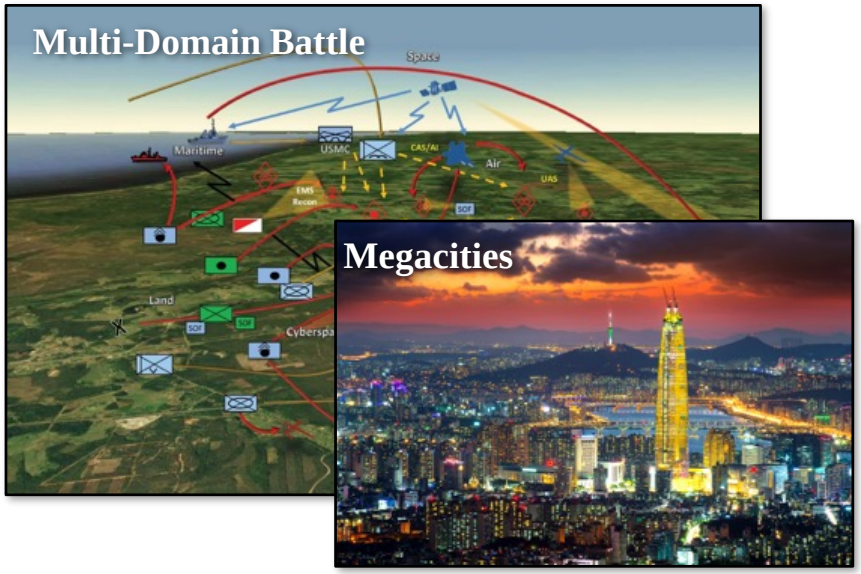
- Resilience training
- Leader training
- Measures of unit cohesion
- Behavioral screens
- Cultural awareness training & education

- Epidemiological studies to evaluate health risks pertaining to military deployments

Wearables for Health, Readiness and Performance

Multi-Domain Operations

Mass Casualties, Prolonged Field Care

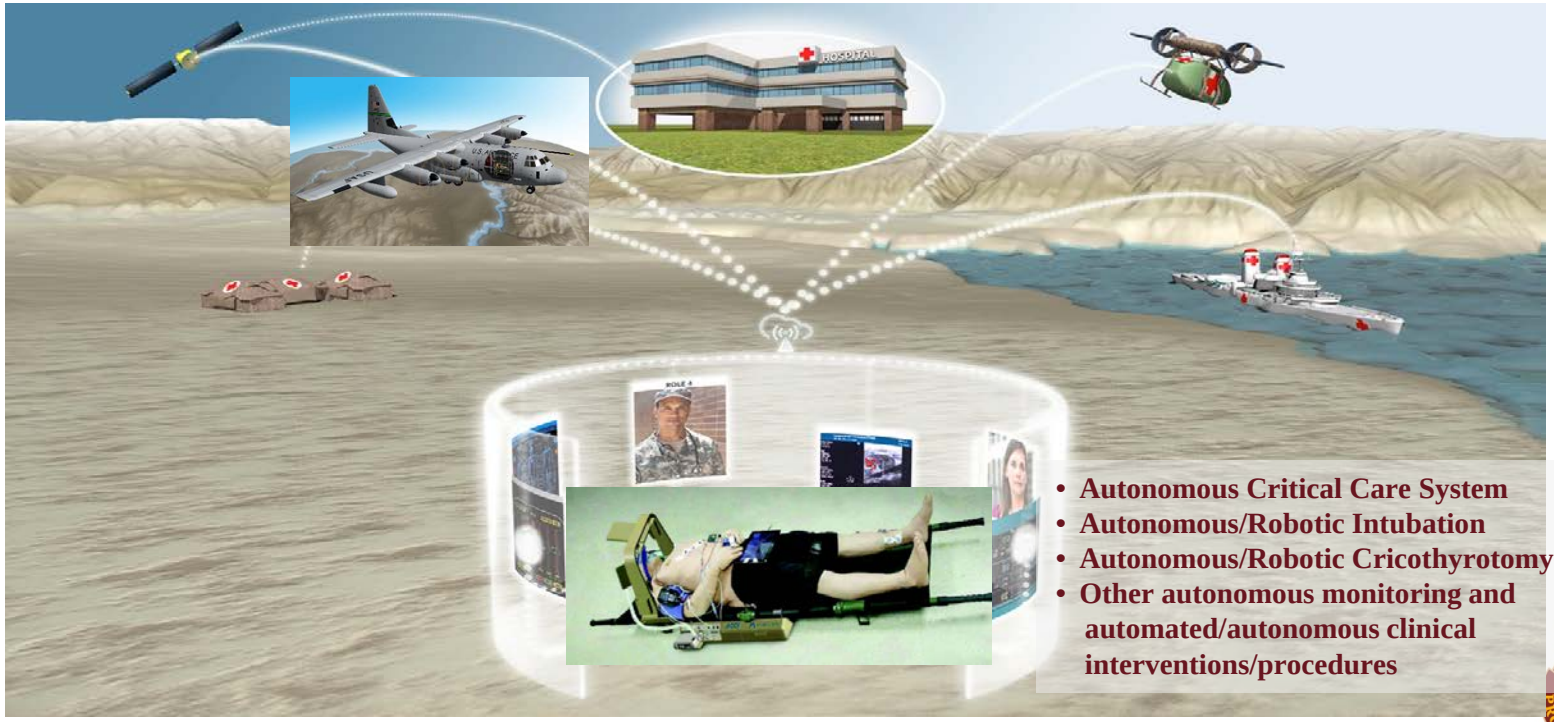


Increased Lethality via Human-Machine Teaming

Ruggedized sensors needed for future conflicts for performance optimization, preventive medicine and patient monitoring

Future of Medical Care

- Semi-autonomous, autonomous and remotely operated medical systems
- Care for soldiers at the point of need
- Interacting with healthcare providers at locations around the globe
- Seamless casualty care delivered from point of injury thru CASEVAC chain to CONUS with significantly reduced logistical footprint



- **Autonomous Critical Care System**
- **Autonomous/Robotic Intubation**
- **Autonomous/Robotic Cricothyrotomy**
- **Other autonomous monitoring and automated/autonomous clinical interventions/procedures**

MOMRP
Medical Research Laboratories

USAMRD-W
Tacoma, WA

US Army Medical Research Directorate-West – Joint Base Lewis-McChord

NHRC
San Diego, CA

Naval Health Research Center - Naval Base Point Loma

NAMRU-SA
San Antonio, TX

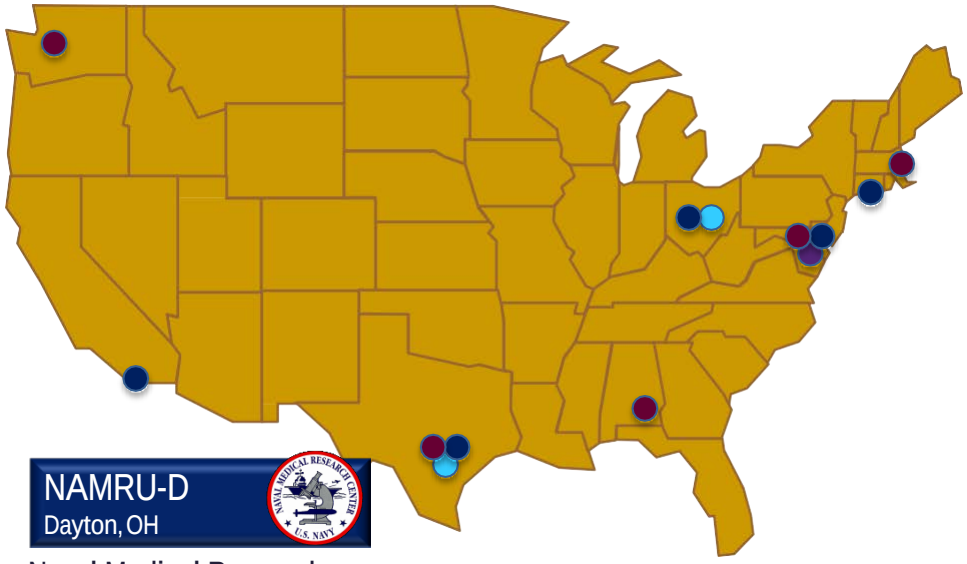
Naval Medical Research Unit - Joint Base San Antonio

USAISR
Ft. Sam Houston, TX

US Army Institute of Surgical Research

59 MDW
San Antonio, TX

59th Medical Wing - Joint Base San Antonio-Lackland



NAMRU-D
Dayton, OH

Naval Medical Research Unit - Wright-Patterson AFB

711 HPW
Dayton, OH

711th Human Performance Wing - Wright-Patterson AFB

USAARL
Ft. Rucker, AL

US Army Aeromedical Research Laboratory

USACEHR
Ft. Detrick, MD

US Army Center for Environmental Health Research

BHSAI
Ft. Detrick, MD

TATRC / Biotechnology High Performance Computing Software Applications Institute

USARIEM
Natick, MA

US Army Research Institute of Environmental Medicine

NSMRL
Groton, CT

Naval Submarine Medical Research Laboratory - Sub Base New London

WRAIR
Forest Glen, MD

Walter Reed Army Institute of Research

NMRC
Silver Spring, MD

Naval Medical Research Center

USUHS
Bethesda, MD

Uniformed Services University of the Health Sciences

NOTE: MOMRP provides funding and oversight to multiple Extramural (e.g., Academia, Industry) performers, as well as other non-medical DoD laboratories.

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MOMRP Gaps: Environmental Health & Protection (1 of 2)

Heat Exposure

- Performance and injury predictions
- Return to duty criteria following heat injury
- Microclimate cooling
- Technologies for optimal hydration/rehydration management

Altitude/Hypoxia Environments

- Performance and injury predictions
- Technologies to support sustained operations

Multi-environmental Stressors

Arctic Operations

MOMRP Gaps: Environmental Health & Protection (2 of 2)

Toxicant Exposure

- Accurate dose information for exposure to industrial chemical mixtures and material hazards
- Technologies and wearable devices to track chemical/toxic hazard exposures

Biomarker Panels to Assess SM Impact

- Toxicant environmental health hazards
- Industrial chemical mixtures found in dense urban environments

Acute and Chronic Health Effects Linked to Response-Biomarkers

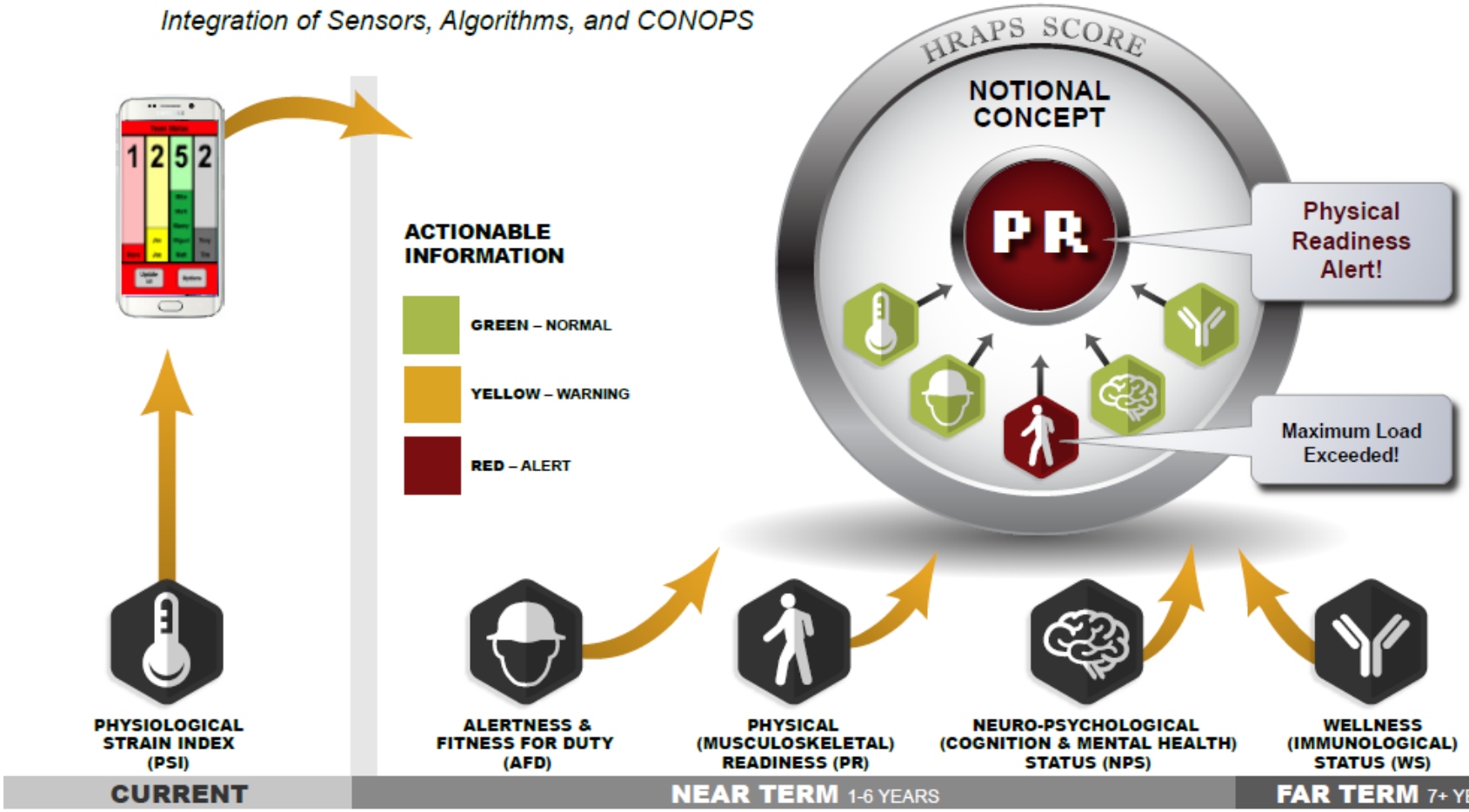
Research Accomplishments/Highlights – ENVIRONMENTAL HEALTH & PROTECTION

- **Altitude Readiness Management System (ARMS):** Integrated handheld software decision aid to plan, monitor and manage unit altitude exposure of unacclimatized Soldiers, predicts altitude illness risk and task performance. Mobile application delivered to Nett Warrior in FY16.
- **Soldier Water Estimation Tool (SWET):** Integrated handheld software decision aid to provide potable water intake requirements for mission planning in hot environments, wearing military ensembles, and different levels of task work. Mobile application delivered to Nett Warrior in FY16.
- **Environmental Sentinel Biomonitor (ESB):** System with two portable sensors to test drinking water in deployed situations and rapidly identify toxicity from wide range of chemicals. Milestone C achieved in FY16.
- **Real-Time Physiological Status Monitoring (RT-PSM):** Wearable system of physiological and performance sensors to assess Soldier thermal strain, energy expenditure, cognitive and physical performance; provides actionable information to prevent injuries and predict readiness. Partnered with PM Medical Support Systems (USAMMDA).
- **Integration of DoD Wearables –** ASD(R&E) asked MOMRP to be DoD lead. Partnering with MIT-LL to ensure an integrated program.

Contributions to Readiness:
Health Readiness & Performance System

Provides small unit leaders with accurate, real-time, actionable information enabling data-driven decisions affecting health, readiness and performance.

Integration of Sensors, Algorithms, and CONOPS



DoD Wearables Initiative

Integration Roadmap

- Cross-Component partnering with academia and industry
- Technology maturity assessment
- Integration strategy

DoD Integration Lead

JPC-5 Program Director

MOMRP Staff & Others

Strategic Recommendations

- Input / coordination from Senior Advisory Groups: *ASBREM & HS COIs*
- Input from other COIs
- Funding strategy

Integration Technical Team
MIT Lincoln Laboratory

Policy and Standards WG
Mr. Steven Jones
OUSD P-R

Body Area Network WG
Dr. Brian Telfer
MIT LL

Wearable Cybersecurity WG
Mr. William Vesey
MIT LL

Interoperable and Open Architectures WG
Mr. Joe Lacirignola
MIT LL

Common Architecture

"As Planned" Integrated Wearable Systems

Dismounted Operation Needs:

- Army
- USMC
- CST/ NGB
- CBRNE
- USAF
- SOCOM
- Navy NECC

Use Case and CONOPS Development WG
Mr. Fred Dupont
MCoE

Technical Working Groups

Use Specific Components

Predictive Modeling WG
Dr. Reed Hoyt
USARIEM

Wearable Sensors WG
Dr. James Christensen
AFRL 711th HPW

Data to Decision Making WG
Dr. David Darkow
NSRDEC

Human Systems Integration WG
Dr. Amar Marathe
ARL

Overarching Objective: Integrated wearable systems that meet Service Member needs

JPC-5: Joint Program Committee-5, MOMRP: Military Operational Medicine Research Program
WG: Working Group, COI: Communities of Interest, HS: Human Systems
ASBREM: Armed Services Biomedical Research Evaluation and Management

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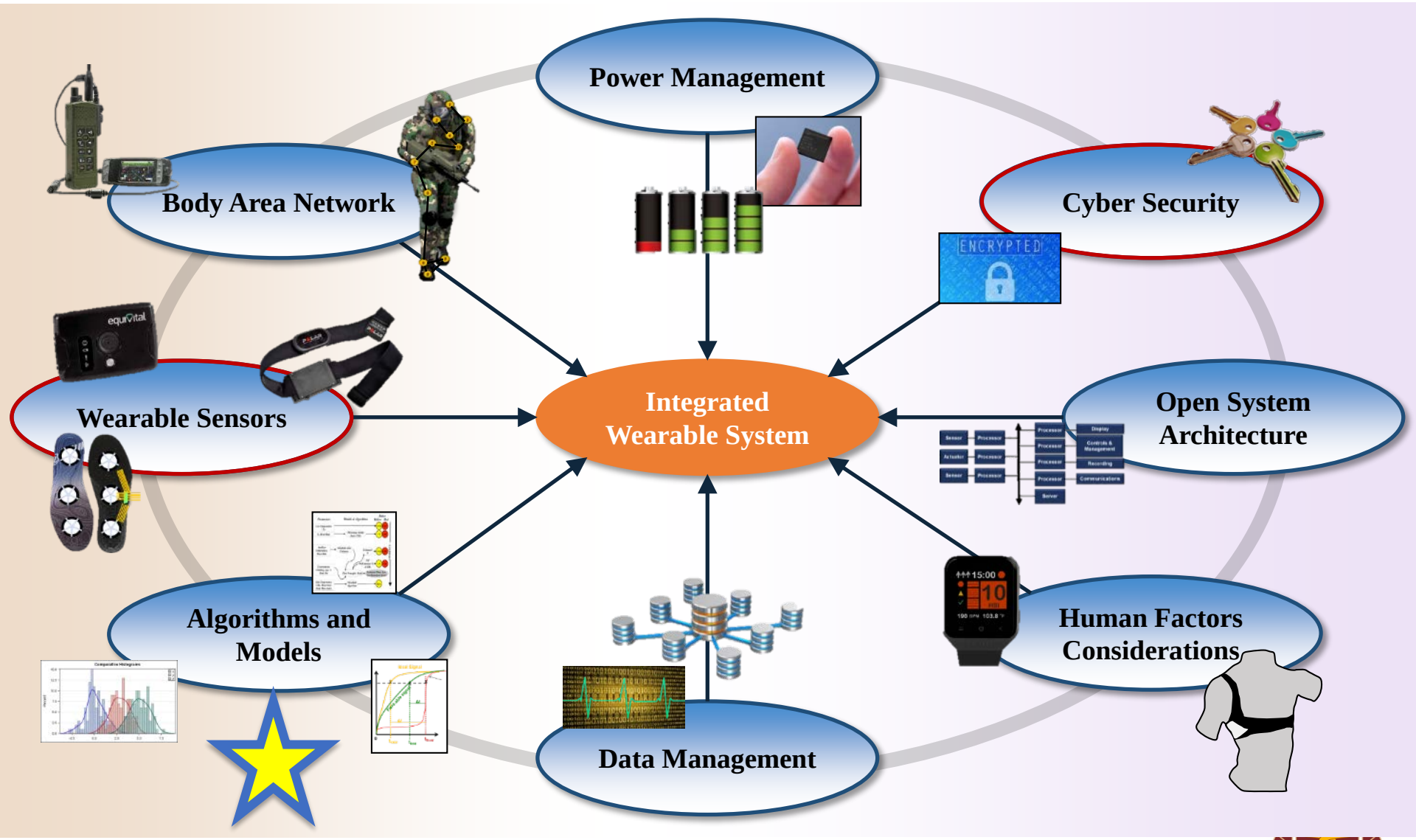
HRAPS and Wearables Approach



DoD Wearables Integration

Actionable Alerts	Sense	Model	Decide	Limitations
Heat stress				Needs compensable/uncompensable modeling, use-specific alerting
Cold stress				Confounded core temperature sensing
Musculoskeletal injury				Limited predictive models
Agility				Limited predictive models
Hypoxia				Challenges in collecting meaningful data
Dehydration				Lacking sensing modality; limited predictive models
Exhaustion / metabolic				Metabolic cost models limited; alert states not well defined
Training recovery				Proprietary commercial products not validated
Diminished cognition / judgment				Alert states not well defined
Alertness				Current metrics require intervention; limited predictive models
Emotional instability				Lacking sensing modalities, alert states not well defined
Infection / bioagent				Primate model data only; alert states not well defined
Stopped activity				Simple 'Are you OK?' based on location / movement
Chemical exposure				Primate model data only; alert states not well defined

Sufficiently validated for routine use

Further development needed

Further research needed

SECDEF Close Combat Lethality Task Force (CCLTF) 2017

SECRETARY OF DEFENSE
1000 DEFENSE PENTAGON
WASHINGTON, DC 20301-1000

4. MISSION STATEMENT. The CCLTF will develop, evaluate, recommend, and monitor the implementation of improvements to U.S. squad level infantry combat formations in order to ensure overmatch against pacing threats and strengthen the combat lethality, resiliency, and readiness of infantry squads.

Close combat focus areas include:

- Manpower policies
- Training
- Lethality
- Mobility & Soldier's Load
- Human Performance (physical & cognitive)
- Sensing
- Survivability
- Sustainment
- Resiliency
- Communications

MOMRP Gaps: Physiological Health & Performance (1 of 3)

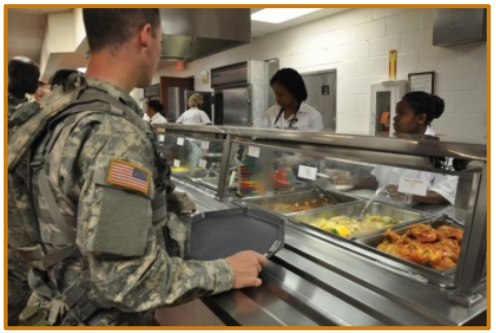
Fatigue Mechanisms and Countermeasures

- Novel mechanisms in understanding/manipulating sleep for performance and health
- Sleep quality assessment that is objective but not necessarily tied to actigraphy/polysomnography – *What are we currently measuring and what are we currently missing?*
- Non-pharmacological manipulation of alertness and sleep
- Use of VALIDATED wearables for Sleep as an indicator/predictor of performance, safety and health
- Management of Circadian rhythms

MOMRP Gaps: Physiological Health & Performance (2 of 3)

Nutrition Solutions, Countermeasures and Strategies

- Nutrition solutions to optimize recovery and sustain the Joint Warfighter under extreme conditions
- Nutritional interventions for mission reset and injury recovery -- countermeasures for physical and cognitive degradation following military operations
- Protection strategies to mitigate operational stress
- Tailored, modular ration components to improve readiness



MOMRP Gaps: Physiological Health & Performance (3 of 3)

Physiological Basis of Resilience and Cognitive Readiness

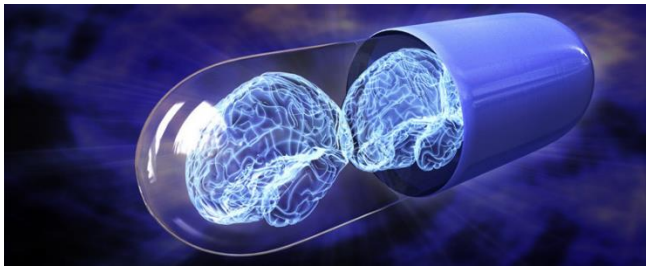
- *Sustain robust cognitive function* in Service members under acute operational psychological/physiological stressors
- *Promote adaptability to novel, militarily-relevant demands* and improve cognitive function in Service members over the course of a training cycle or career

Research Accomplishments/Highlights – PHYSIOLOGICAL HEALTH & PERFORMANCE

- **Fatigue and Sleep Management:** User-friendly platform-specific tool to predict alertness based on sleep/wake history, circadian factors, and countermeasures. Materiel and knowledge products from MOMRP sleep program inform sleep guidance for the Army Office of the Surgeon General (OTSG).
- **Healthy Eating and Lifestyle Training Headquarters (H.E.A.L.T.H.):** Congressionally-supported effort to aid Soldiers/Families to maintain weight, fitness, combat readiness, and performance using portable, interactive technology; transitioning to Performance Triad platform for implementation.
- **Recovery Nutrition:** Specifications for rations/menus/dining facility feeding plans to promote rapid recovery after missions by replenishing nutrients/energy, promoting muscle/bone/brain healing, optimizing cellular resistance to trauma/stress, and accelerating recovery from physical injury or illness.
- **Physiological Basis of Resilience:** Studies in high intensity, high stress training scenarios to begin to document biomarkers that are predictive of performance under stressful conditions.
- **Load Carriage Decision Aid (LCDA):** Comprehensive tool that predicts Soldier metabolic cost as a function of individual and clothing characteristics, load carried, terrain, weather, and nutritional intake. Tool provides Soldiers and their leaders with guidance to prevent physical injuries associated with over-burden that can improve mission success. Currently in Advanced Development.

Sleep and Circadian Disruption

- Numerous tools developed for sleep manipulation, none validated for field reliability
- Efforts to improve understanding, monitoring and TRANSLATION of what predictive sleep models really mean
- COTS tools for circadian alignment (e.g., mitigate jet lag)
- We have an 80% solution – but to what? Ad lib caffeine and sleep as you can…however, longitudinal impacts are debilitating



Sleep disruptions occur for only 3 basic reasons…

Prioritization of Sleep

An Often Unrelenting Operational Tempo

Physiological or Psychological Roadblocks

Biomedical Performance Enhancement

Biomedical Performance Enhancement (BPE)

- Warfighter as weapon – augmented hardiness, accelerated training, faster decisions
- Scalable and ethical modalities and interventions to ensure overmatch
- Human genetics of extreme performance (selection, manipulation)
- Pharmaceutical interventions enhancing physical, cognitive or psychological performance
- Medical integration with exoskeleton technologies

Performance Pharmacology

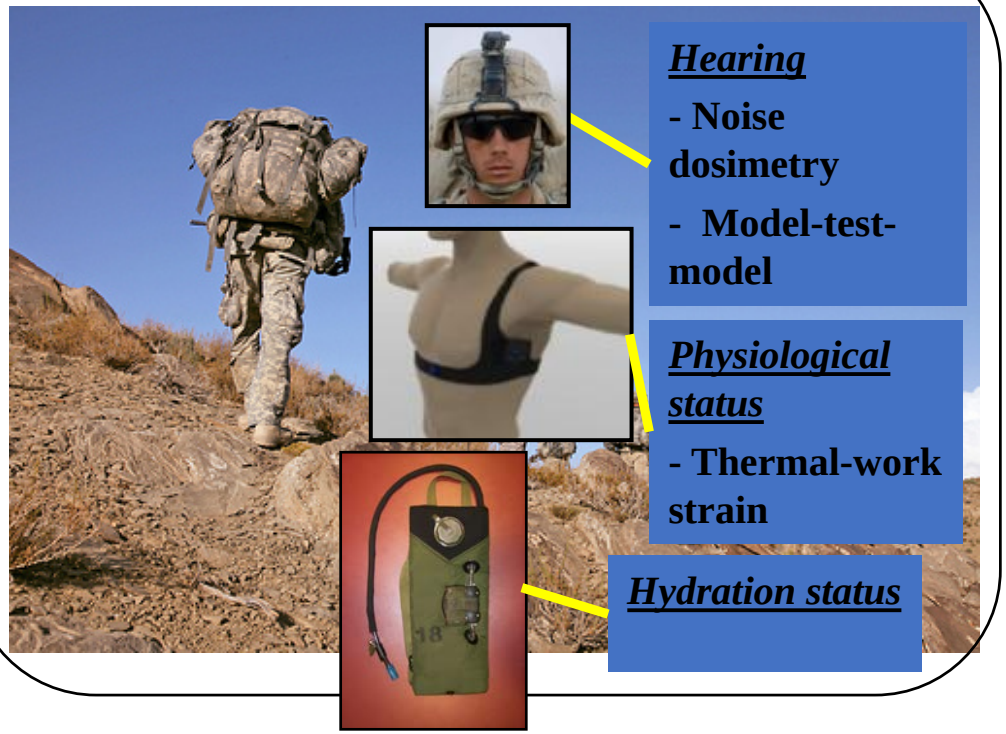
TABLE 1. Substances prohibited in international sports competition (source: http://list.wada-ama.org/prohibited-in-competition/prohibited-substances/).

Drug category	Definition or examples	Tested with soldiers
Nonapproved substances	Substances with no current approval for human therapeutic use	
Anabolic agents	Androgens, androgen metabolites, and anabolic steroids	Testosterone enanthate, methyltestosterone, and nandrolone decanoate
Peptide hormones, growth factors, related substances, and mimetics	Erythropoietins, growth hormones, and hypoxia-inducible factor activators (e.g., argon, xenon)	Autologous blood transfusion*
Beta-2 agonists	Clenbuterol, isoprenaline, and salbutamol†	Salbutamol
Hormone and metabolic modulators	Myostatin inhibitors, estrogen inhibitors, and insulins	Testolactone
Diuretics and masking agents	Probenecid, acetazolamide, and furosemide	Acetazolamide (for prevention of acute mountain sickness)
Stimulants	Amphetamine, modafinil, cocaine, ephedrine, epinephrine, and caffeine‡	Amphetamine, modafinil, and caffeine
Narcotics	Buprenorphine, morphine, and oxycodone	
Cannabinoids	Cannabis and delta 9-tetrahydrocannabinol	
Glucocorticoids	Cortisone, prednisone, and dexamethasone	Compound "E" (cortisone)

*Manipulation of blood or blood components is a "prohibited method."
†Permitted in competition below a maximum dose.
‡No longer banned but monitored in competition for "patterns of misuse."

"Technological doping" – physiological pacing tools

Sensors



Hearing

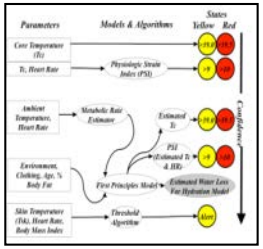
- Noise dosimetry
- Model-test-model

Physiological status

- Thermal-work strain

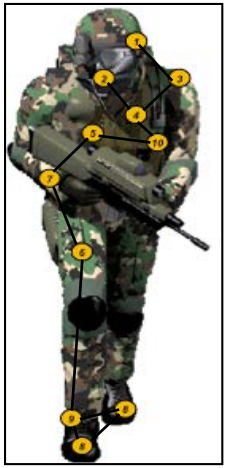
Hydration status

Computational Physiology



- •Heat strain management
- Tcore from Heart rate
- Energy expenditure
- Hydration state

Wireless Body Area Network



Open System Architecture

Partnership with MIT Lincoln Laboratory (www.ll.mit.edu) to define non-proprietary open-system architecture solutions to enable maximum flexibility, reliability, and reduced cost

MOMRP Gaps: Injury Prevention & Reduction (1 of 2)

Training and Operational Environments

- Improved understanding of the physiological mechanisms underlying musculoskeletal injuries
  - Advanced technologies for real-time assessments outside of the clinic
- Physical fitness training strategies to reduce the risk of injury from load, jolt, vibration, etc.
- Countermeasures to mitigate injury risk potential for exploitation in training environments

MOMRP Gaps: Injury Prevention & Reduction (2 of 2)

Training and Operational Environments

- Development of injury criteria for Personal Protection Equipment against blunt, blast and ballistic trauma threats
- Injury criteria and medical performance standards to protect against hearing loss, vestibular injury, and ocular facial injury
- Standards and criteria to identify when Warfighters are capable to Return-to-Duty (RTD), fully able to perform demanding tasks

Research Accomplishments/Highlights – INJURY PREVENTION & REDUCTION

- **Occupational Physical Assessment Tool (OPAT):** TRADOC/USARIEM initiative to determine performance requirements for physically-demanding MOSs and develop gender-neutral standards & assessments to match Soldiers to right MOS, increase MOS success and prevent injuries. Implemented Army-wide in JAN 17.
- **Environmental Sensors in Training (ESiT):** Technical requirements and methodologies for blast and head impact sensors in the field; brain health risk prediction models for cumulative blast and head impact exposures to optimize human performance in training and increase medical readiness.
- **Eye Protection:** Optometric standards and guidelines for protective eyewear that will increase aircrew acceptance, protection, and compatibility with flight systems.
- **Hearing Protection Standards:** Validated impulse noise limits standards and hearing protection testing methodology guidelines for hearing hazard assessments.
- **Pharmaceutical Intervention for Noise-induced Hearing Loss:** Successful S&T program (Materiel Development Decision JUL 16) for prophylactic administration to prevent/mitigate noise-induced hearing injury and, in turn, prevent permanent and irreversible hearing loss.

MOMRP Support of Lethality

- **Medical Criteria for Helmets and Body Armor**
  - Behind Helmet Blunt/Ballistic Trauma to support development, test and evaluation, and acquisition of future head protection systems for the DoD

- The Joint Force lacks sufficient capabilities to mitigate or eliminate the effects of blast, ballistic, blunt … threats to the operational health, readiness, and performance of SMs in all environments - **Joint Initial Capabilities document for Military Operational Medicine, dated October 2017**

*****Currently there exists no medical criteria for helmets to stop ballistic threats outside of the 9mm**

There could be significant brain injury risk due to back face deformation resulting from defeating round penetration.

- **Medical research program in need of additional support starting in FY20:**
  - **Behind Helmet Blunt/Ballistic Trauma to support development, test and evaluation, and acquisition of future head protection systems for the DoD**
    - **MRMC led effort with collaboration with ONR, ARL, and SOCOM**

MOMRP Gaps: Psychological Health & Resilience (1 of 2)

Service Member Resilience

- Evidence-based individual and group interventions and technologies to promote Resilience
- Resilience training that incorporates key behavioral health outcomes
- Biomarkers of resilience

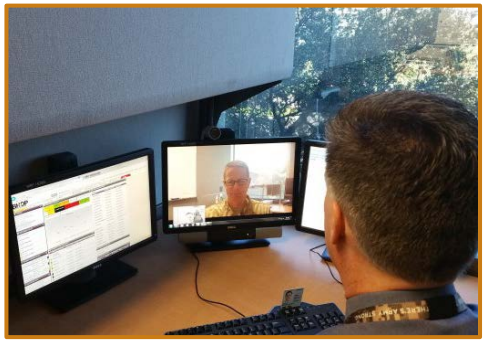
Behavioral Health

- Tools and technologies to better prevent, diagnose, and treat mental health issues such as suicide and substance abuse

MOMRP Gaps: Psychological Health & Resilience (2 of 2)

Psychological and Behavioral Health

- Non-self report assessment technologies of psychological well-being and status
- Telemedicine and mental/behavioral health approaches that overcome barriers/challenges
- Identification/validation of biomarkers for Post Traumatic Stress Disorder (PTSD)
- Translational efforts on the diagnosis and treatment of PTSD



Research Accomplishments/Highlights – PSYCHOLOGICAL HEALTH & RESILIENCE

- **Deployment Cycle Resilience Training (DCRT):** Skills-based training to enhance Service member and Family resilience to occupational stressors and mitigate negative behavioral health problems. The Walter Reed Army Institute of Research (WRAIR) Research Transition Office works with the Army Resiliency Directorate (ARD) to transition products to the field on an ongoing basis.
- **Brief Cognitive Behavior Therapy for Suicide (BCBT):** Randomized controlled trial (RCT) demonstrated a competency-based 12-session outpatient psychotherapy reduced suicide attempts by 60% among high-risk active duty Soldiers compared to treatment as usual. A training curriculum was developed and a treatment manual will be published (2017). Replication trial is planned for 2018.
- **Crisis Response Planning (CRP):** CRP increasingly used as a stand-alone intervention for reducing suicide risk. Two RCTs demonstrated that CRP led to a 75% reduction in suicide attempts compared to treatment as usual (2017). A manual and training curriculum are available through the National Center for Veteran Studies, University of Utah.
- **Epidemiological Work:** Ongoing work is aimed at understanding emerging threats to psychological and physical health in order to identify modifiable risk and protective factors to enhance readiness. One of the flagship efforts is the prospective longitudinal Millennium Cohort study which includes over 200,000 Service members with matched spouse dyads.

Research Accomplishments/Highlights – PSYCHIATRY & CLINICAL PSYCHOLOGY DISORDERS

- **Treatment for PTSD:** Determining efficacy of PTSD psychotherapies in military populations. Exploring augmented psychotherapies (e.g., Virtual Reality, Cognitive Enhancing Medications), adaptations (e.g., couples/group therapy, tele-behavioral health, intensive outpatient modalities) and novel treatments (e.g., animal assisted psychotherapy, brain stimulation, nutritional neuroprotection, exercise and mindfulness).
- **Compressed PTSD Psychotherapy Regimens:** Demonstrated 3 weeks of daily exposure-based therapy to be equivalent to traditional, 15 weekly sessions care delivery. Findings have the potential to drastically reduce treatment dropout rates.
- **Objective PTSD Screening Tools:** PTSD foundational science research focused on etiology, common co-morbidities, and identification of objective biomarkers (e.g., blood-based, imaging, voice and facial micro-features), and neurological treatment targets.
- **Improving Access to Behavioral Health Care:** Research and development of training programs for improving Soldiers' understanding of and attitudes toward Behavioral Health will reduce stigma and minimize other barriers to care seeking. Provider training and skill development also seeks to minimize treatment dropout.
- **Family and Social Support for Behavioral Health Care:** Demonstrated that patient dropout from PTSD treatment is significantly reduced if family members and/or friends are aware, supportive, and involved in the delivery of care process.
- **Tools for Behavioral Health Return-to-Duty Decision-making:** Development of standardized psychological measurement practices and identifying critical data points to better support RTD decision making.
- **Psychopharmacological PTSD Treatments:** High-priority research continues to identify novel pharmaceutical interventions for more effective PTSD treatment in military populations.

MOMRP Support of Lethality

- **Psychological and Behavioral Influences to CCLTF**
  - Small Unit Team Cohesion
  - Post-traumatic Growth
  - Resilience and Mindfulness Efforts
- **Far-forward Behavioral Health**
  - Acute Stress reaction focus
  - Incorporation of predictive sensory analytics (multimodal)

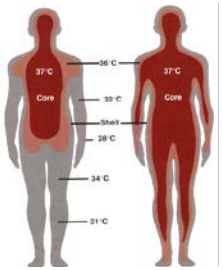
Movement does not break machines, friction does.

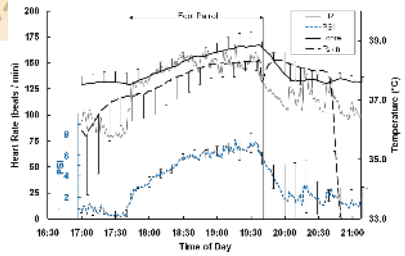
We have to improve the measurement and surveillance of our operational forces. Medical readiness can and should be re-tooled for this…

Integration of the small squad/unit moving parts is also imperative.

Precision Operational Medicine

- Physiological monitoring provides real-time feedback on Health, Readiness and Performance State of Warfighter
  - Thermal work strain prediction
  - Permits Warfighter to work within physiological limits& moderate intensity to sustain performance.
  - To make a difference, need to share data. Lots of it.





- Biological technologies to characterize Warfighter potential and injury risks
  - Vitamin D receptor polymorphisms & training injury
  - Physiologic, metabolomic & genetic biomarkers of military resilience

MOMPR DESIRED TECHNOLOGIES

- Precision Operational Medicine approaches
- Ambulatory and Ecological Brain Imaging
- Expanded individual monitoring for Occupational and Environmental Exposures
- Sensors that can accurately measure accelerations in the military training environment
- Non-invasive soft tissue imaging for MSKI detection
- Glymphatic Manipulation capabilities
- Wider use of Metabolomics
- Precision Nutrition and Metabolic Assessments

MOMPR DESIRED CAPABILITIES

- Operational risk planning tools for environmental threats
- Decision aids to prevent warfighter performance degradation in extreme environments
- New physical fitness standards to prevent musculoskeletal injuries
- Unit leader tools to reduce musculoskeletal injuries
- Leader decision aids to manage blasts and head impacts
- Medical interventions for circadian and sleep management
- Biomedical performance enhancement technologies
- Optimal delivery of far forward psychological health care
- Unit-level psychological interventions to enhance performance
- Objective, non-self-report real-time assessments of psychological health status
- Technologies to assess and match individuals to the right training at the right time

DoD Biomedical Funding Opportunities

Defense Health Agency – Joint Program Committees: "Multiservice" Organization

Congressionally Directed Medical Research Program (CDMRP)
http://cdmrp.army.mil/funding/apply or http://cdmrp.army.mil/about/resources.aspx

Other service Investments:
Army Research Office (ARO),
Office of Naval Research (ONR),
Air Force Office of Scientific Research (AFOSR)

Defense Threat Reduction Agency (DTRA)
Defense Advanced Research Projects Agency (DARPA)
Intelligence Advanced Research Projects Agency (IARPA)

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Summary

- A relevant program on YOUR topic area likely exists in the DoD
  - Be willing to discuss topic/idea with program officers/program managers. We need to champion your ideas

- Our role is to fit what you have into a larger vision
  - We are solving operational problems with basic and applied research
  - One's research almost never simply plugs into what we are currently doing
    - Improvement is often an iterative process
    - Not all of our solutions need early stage research

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MOMRP Contact Information

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Questions?

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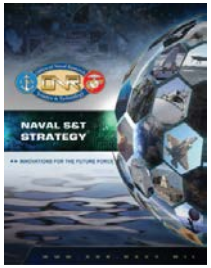
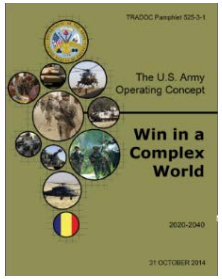
Congressional Budget Activities and Defined Purposes

- 6.1 Basic Medical Research Science – attaining 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/components of early prototype systems for test and evaluation, incl support of early stage clinical trials
- 6.4 Advanced Component Development – clinical trials for FDA licensed products and accelerated transition of FDA regulated and non-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 commodities prior to initial full-rate 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 Sustainment Activities – pre-planned product improvement of fielded medical products and evaluation of the effectiveness of fielded products, therapies, treatments or medical guidelines

MOMRP Requirements and Strategic Documents

- Joint Military Operational Medicine Initial Capabilities Document (ICD) Joint Requirements Oversight Council (JROC) approved NOV (2017)
- Secretary of Defense (SECDEF) Close Combat Lethality Task Force (2017)
- Navy Science and Technology Strategy (2016)
- US Army Integrated Head Protections Systems Capability Production Document (CPD) (2016)
- Chief of Naval Operations (CNO) Navigation Plan (2016-2020)
- White House Precision Medicine Initiative (2015)
- Air Force Strategic Master Plan (2015)
- Air Force Research Development Document
  - Battlefield Airman Performance Optimization
  - Medical Countermeasures of Directed Energy Enterprise
  - Total Exposure Health





- Defense Health Board Assistant Secretary of Defense Force Health Protection & Readiness [ASD(FHP&R); 2015] recommendations for a comprehensive approach to assess and prevent deployment related respiratory disease and or future research and surveillance
- Defense Health Board Report: Deployment Pulmonary Health (Feb 2015)
- Joint Non-Lethal Weapons Program S&T Strategic Plan 2016-2025 (2015)
- Army Vision Force 2025 and Beyond (2014)
- Training and Doctrine Command (TRADOC) Pamphlet 525-3-1 US Army Operating Concept Win in a Complex World (2014)
- TRADOC Pamphlet 525-3-7 Human Dimensions ICD (2014)
- Naval Aviation Vision 2014-2025 (2014)
- National Research Action Plan (2013)
- VA/DoD Deployment Health Working Group Airborne Hazards Joint Action Plan In Support of the VA/DoD Joint Executive Council Strategic Plan (Dec 2013)