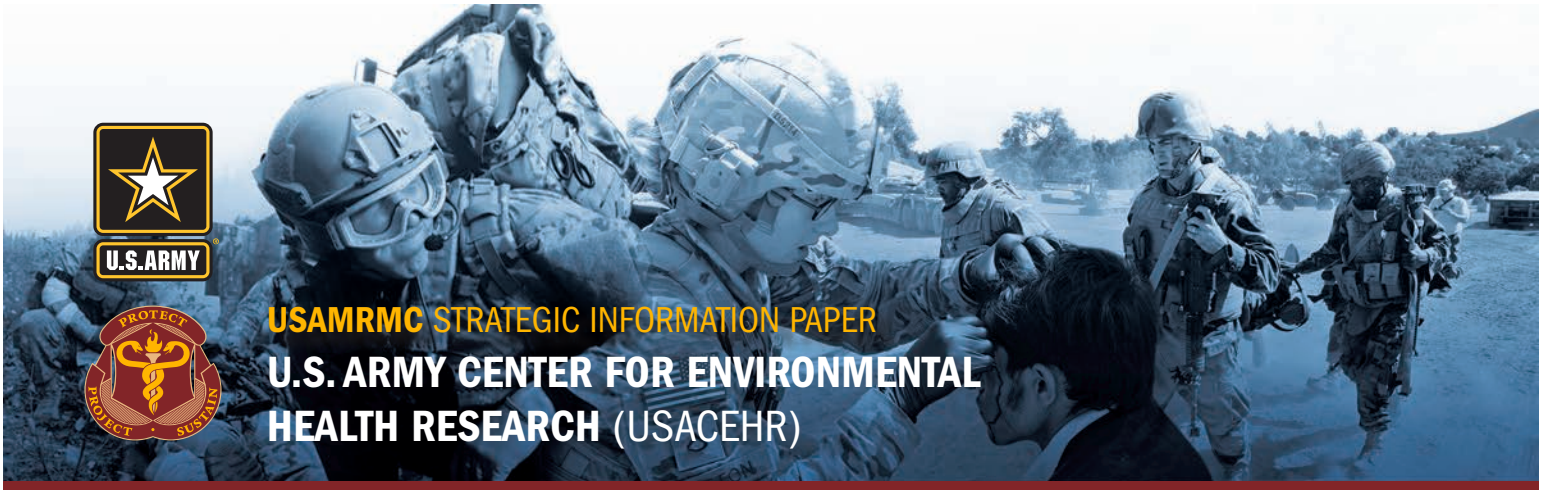

USAMRMC STRATEGIC INFORMATION PAPER

U.S. ARMY CENTER FOR ENVIRONMENTAL HEALTH RESEARCH (USACEHR)

MISSION

Develop surveillance capabilities to detect, assess, and prevent health effects from adverse environmental, physiological, and psychological exposures.

BACKGROUND

USACEHR has the lead among MRMC laboratories to address potential health effects resulting from exposures to environmental toxicants, hazardous materials, and pollutants. USACEHR researchers develop surveillance tools and countermeasures against adverse health effects that degrade Warfighter health and performance, to include products that assess responses to environmental toxicant/pollutant exposures.

The USACEHR applies an integrative systems biology approach to environmental, physiological, and psychological threats using a state-of-the-art vivarium and laboratories located at Fort Detrick, Maryland. The USACEHR is expanding its capabilities in genomics, proteomics, transcriptomics, metabolomics, and high performance computing to serve as the USAMRMC-wide Systems Biology Enterprise. In this role, the USACEHR offers tremendous opportunities to accelerate the pace of discovery for biomedical applications through the use of experimentation that is tightly linked to mathematical models and a better understanding of biological networks and molecular biology.

> *"The USACEHR applies an integrative systems biology approach to environmental, physiological, and psychological threats using a state-of-the-art vivarium and laboratories located at Fort Detrick, Maryland."*

The USACEHR is an outgrowth of a robust and comprehensive toxicology program that existed as part of the US Army Medical Bioengineering Research and Development Laboratory (USAMBRDL) under the US Army Medical Research and Materiel Command. USACEHR today operates as a subcommand of the US Army Medical Research Institute of Chemical Defense (USAMRICD). The USACEHR research areas include integrative systems biology, biomarkers, pulmonary health, and biomonitoring capabilities.

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Integrative Systems Biology Program:

The Integrative Systems Biology Program at USACEHR is focused on comprehending the etiology of and finding solutions for military-relevant health issues. Integrative research and analyses are designed to understand, compare, and combine data from animal studies and human studies and computational outlooks. The leading projects include molecular interpretation of host-pathogen relationship, tissue regeneration carried out in a microgravity environment, nutrigenomics, and pan-omics investigation of Post-Traumatic Stress Disorder (PTSD) prevalence and coagulopathy using biological samples from human and animal models.

Biomarkers Program:

The Biomarker Discovery group is a multi-pronged research program aimed at delivering diagnostic, prognostic, and therapeutic solutions to the Soldiers exposed to hazardous environmental chemicals and materials. Our aim is to develop surveillance tools and countermeasures based on molecular pathways of toxicity, the individual host response to exposures, and next generation of diagnostic systems.

Pulmonary Health Program:

The Pulmonary Health Program focuses on multidisciplinary approaches for evaluating respiratory health risks to service members from exposures to man-made and natural materials. During deployments Soldiers and other service members can be exposed to naturally occurring fine dust particles, burn-pit smoke, and other kinds of air pollution. The Pulmonary Health Research Program uses clinical, epidemiological, and toxicological studies to determine the prevalence and severity of pulmonary disease associated with deployment-related exposures, to identify factors that affect disease causation and progression, and to improve clinical diagnosis.

Biomonitoring Program:

The Biomonitoring Program places a strong emphasis on delivering medical products to help avoid illness or injury of the warfighter from environmental toxic exposures in the operational environment. Recent projects include developing rapid field-deployable toxicity sensors to prevent adverse health effects from

KEY THEMES AND MESSAGES

USACEHR hosts the USAMRMC-wide Systems Biology Enterprise, integrating large data sets with human or animal, clinical, physiological, and other similar metrics to identify networks and pathways to develop simulation models for application to military-relevant illnesses.

USACEHR provides a data warehouse (SYSBIOCUBE) for information analysis, mining, and integration of various data types for military-relevant illnesses for use locally, USAMRMC-wide, and in partnership with other research laboratories.

USACEHR conducts and coordinates research on the toxicological hazards to deployed forces from hazardous environmental chemicals or materials (e.g., pulmonary and engineered nanomaterials).

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environmental contaminants in drinking water supplies. Building upon this experience and success, USACEHR will continue to develop new and innovative research tools and capabilities to address emerging environmental health threats and to incorporate innovative toxicity detection capabilities for air, water, and soil to protect the warfighter.

QUESTIONS & ANSWERS

Q *How does your subcommand impact Force Health Protection and Readiness goals?*

A USACEHR has a several intensive projects focused on identifying early molecular indicators of PTSD and response to environmental hazards. For example, biomarkers to diagnose PTSD are being tested in a validation study to 'personalize' therapy and to optimize the success rate for PTSD treatment for improvement of the return-to-duty rate.

Q *Does USACEHR partner with any civilian hospitals or laboratories in its research?*

A USACEHR is partnering with two large PTSD consortia which include 6 major medical centers and 3 additional university laboratories. These partnerships include Nobel Laureates who are applying their expertise to this debilitating disorder.

Q *Do military personnel or civilians participate as subjects in USACEHR research?*

A No. USACEHR does not interact with human research subjects. No personal identifying information (PII) is ever obtained/used at USACEHR. However, some studies include coded, de-identified data from active duty military personnel and Veterans as part of an effort to improve diagnostics and therapeutics for disease and injury.

Q *How does USACEHR research benefit both military and civilian health?*

A All of the research programs at USACEHR have the potential for military and civilian applications. For example, USACEHR's work with the PTSD consortia is a direct example of how USACEHR leverages civilian research. The trajectory of clinical and molecular responses within the first 12 hours or few days following trauma are readily studied in a civilian population, but are not as feasible to evaluate in a battlefield situation. Additionally, PTSD in the civilian realm, while thought to have some

KEY THEMES AND MESSAGES

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USACEHR identifies biomarkers of toxicity and health effects for hazardous environmental chemicals or materials.

USACEHR coordinates a Science, Technology, Engineering, and Mathematics (STEM) program and offers internships/fellowships in molecular, computational biology, and other aspects of systems biology for pre-doctoral/MS, undergraduate, and pre-college students.

USACEHR is the only USAMRMC medical research laboratory that maintains a unique aquaculture facility for non-mammalian toxicology studies.

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key differences from military-acquired PTSD, may prove to have overlaps that can lead to improved therapeutic efficacy. USACEHR has developed toxicity sensors for rapid evaluation of drinking water safety that are being used in both military and civilian settings. Biomarkers associated with liver and kidney toxicity will benefit those exposed to hazardous industrial chemicals and materials.

Q ***How does USACEHR interact or collaborate with other government agencies?***

A The USACEHR provides research collaboration and subject matter expertise to multiple agencies, such as: the Centers for Disease Control and Prevention, the National Institutes of Health, the Frederick Cancer Institute, the Defense Advanced Research Projects Agency, The Joint Project Management Office of Medical Countermeasure Systems, the Defense Threat Reduction Agency, the National Institute of Safety and Health, the Federal Bureau of Investigation, and other Department of Army and Department of Defense facilities (Sandia National Labs, the US Army Public Health Command, Edgewood Chemical Biological Center, other USAMRMC Labs, and the Uniformed Services University of the Health Sciences).

Q ***Who funds USACEHR's research programs?***

A Currently, the Army funds a large portion of USACEHR's programs ($4.7M). The USACEHR also receives funding support from the Defense Health Agency ($5.8M) and from the Defense Threat Reduction Agency ($0.6M).

> *"Building upon this experience and success, USACEHR will continue to develop new and innovative research tools and capabilities to address emerging environmental health threats and to incorporate innovative toxicity detection capabilities for air, water, and soil to protect the warfighter."*

Q ***What's on the horizon for USACEHR?***

A The USACEHR is standing up a new state-of-the-art rodent vivarium and instrumentation laboratory. This benefits our systems biology research, complements our existing aquatic facility, and expands our capability to conduct toxicology research. The USACEHR is developing a variety of products to improve diagnosis and therapeutics for service-related disorders and health surveillance for environmental threats.

Q ***Do USACEHR and its partners abide by animal use guidelines in their research?***

A Yes. All experimental protocols involving the use of animals are approved by the Institute's Animal Care and Use Committee, and all procedures are conducted in accordance with the principles stated in the Guide for the Care and Use of Laboratory Animals and the Animal Welfare Act of 1966 (P.L. 89-544), as amended. The USACEHR is an Association for Assessment and Accreditation of Laboratory Animal Care International-accredited facility.

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Q *Does USACEHR participate in any educational outreach and training programs?*

A Yes. USACEHR coordinates a Science, Technology, Engineering, and Mathematics (STEM) program, which provides internships/fellowships in molecular, computational biology and other aspects of systems biology for pre-doctoral/ masters, undergraduate and pre-college students.

Q *Is USACEHR's research publicly available?*

A Yes, researchers at the USACEHR publish their findings in peer-reviewed scientific journals. A listing of recent publications can be found on our website: *http://usacehr.amedd.army.mil*