APPENDIX D

Airborne Hazards Joint Action Plan

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VA/DoD Deployment Health Working Group
Airborne Hazards Joint Action Plan
In Support of the VA/DoD Joint Executive Council Strategic Plan

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Mission[1]

To improve the quality, efficiency, and effectiveness of post-deployment health services to Veterans, service members, and military retirees with health concerns related to airborne hazards through a partnership between the Department of Veterans Affairs (VA) and the Department of Defense (DoD).

Vision Statement

A world-class partnership that promotes seamless, cost-effective, quality post-deployment health care policy to beneficiaries and value to our nation

Guiding Principles

COLLABORATION – to achieve shared goals through mutual support of both our common and unique mission requirements

STEWARDSHIP – to provide the best value for our beneficiaries and the taxpayer

LEADERSHIP – to establish clear policies and guidelines for a VA/DoD partnership, to promote active decision-making, and to ensure accountability

1. Derived from VA/DoD Joint Executive Council Strategic Plan FY 2009-2011.

Pages 1 and 2 intentionally omitted from this section.

Background

Numerous concerns on the part of active duty Service members and veterans, the media, and the Congress have been raised regarding possible long-term health effects associated with exposures to burn pit smoke and the elevated levels of airborne particulate matter common to Southwest Asia. For example, specific concerns among Operation Iraqi Freedom Veterans were expressed to SECVA in 2009 in letters from Senator Akaka and Congressman Bishop, along with six co-signers. The letters solicited VA's plans to track and evaluate possible long-term health problems among troops exposed to hazardous materials from open waste burn pits. Burn pit waste disposal at the Joint Air Base Balad (JBB), located in northern Iraq, and elsewhere in Iraq and Afghanistan has been a focus of health concerns among Servicemembers, Veterans, and their families, as evidenced by multiple news articles, Congressional hearings, and other inquiries. Joint Balad Air Base, which at one time had the largest burn pit in Iraq, housed up to 30,000 U.S. Servicemembers at one time with frequent turnover, with hundreds of thousands of Servicemembers assigned to, or passing through, this location.

VA requested that the Institute of Medicine (IOM) review the long-term health impact of burn pit exposure in Iraq or Afghanistan after reports of increasing health concerns by Veterans and other stakeholders coupled with media reports and scientific studies. The IOM Study started in November 2009. The review was inconclusive as to the long-term health consequences of burn pit exposure (IOM, 2011).

Reports of airborne exposures in Iraq are not limited to burn pits. In the spring of 2003, during the early portion of Operation Iraqi Freedom, up to 800 U.S. Service members were potentially exposed to hexavalent chromium dust, recognized as a cause of lung cancer, while guarding a former Iraqi industrial water treatment plant. In another instance, soldiers near the city of Mosul, Iraq were potentially exposed to sulfur dioxide when involved in firefighting operations at a sulfur mine (USAPHC, May 2010). Sulfur dioxide is a known respiratory irritant with a potential to cause long-term adverse health effects (Baird, 2012 54;6). DoD and VA programs were initiated to identify and ascertain the status of their health. Concerns over airborne particulate matter (PM) (e.g., blowing geologic dusts and industrial pollution) prompted DoD to consult with the National Institute for Occupational Safety and Health (NIOSH) in 2005 and to conduct more extensive air sampling throughout the U.S. Central Command (CENTCOM) Area of Responsibility, including Afghanistan (Desert Research Institute) This sampling activity was reviewed in a report by the National Research Council (NRC) of the National Academies of Science (NAS). NRC was unable to determine whether the airborne particulate matter posed a long-term health risk and commented, "The

committee recognizes the difficulty of performing sampling and health studies in an active theater. However, it also recognizes that exposure sources in this environment are more complex and potentially more toxic than in the United States and Europe, where health studies are traditionally conducted." (NRC, 2010).

DoD and VA are working closely together to address environmental health concerns of U.S. Servicemembers and Veterans who served in recent conflicts in Iraq and Afghanistan. These concerns include potential exposure to airborne hazards associated with open waste burning pits (burn pits) commonly used for trash disposal during deployment. Veterans of the 1991 Gulf War also expressed significant adverse health effect concerns from exposure to smoke from burn pits, as well as oil well fires. The Gulf War concerns were discussed in the National Academy of Sciences (NAS) Institute of Medicine (IOM), "Gulf War and Health" series of reports (IOM, 2006).

IOM Committee Findings

- **Limited/Suggestive evidence of an association between exposure to combustion products and reduced pulmonary function [Note: not respiratory disease] in the surrogate populations studied**
- **Inadequate/insufficient evidence of an association between exposure to combustion products and cancer, respiratory diseases, circulatory diseases, neurologic diseases, and adverse reproductive and developmental outcomes in the [surrogate] populations studied**

Discussion of Findings

The IOM report, "Long-Term Health Consequences of Exposure to Burn Pits in Iraq and Afghanistan," was a special report requested by the VA and was not required by law. This report was requested in order to address both Veterans' concerns and the uncertainties in exposure assessment and risk assessment drawn from field monitoring and health outcome data. For this report, the IOM Committee used a wide range of data sources to include peer-reviewed literature, government reports, raw environmental monitoring data, public comment, and other government documents.

The IOM first assessed the "types and quantities of materials burned during the time of pit use." It next analyzed air monitoring data collected at JBB during 2007 and 2009. It then examined "anticipated health effects from exposure to air pollutants found at JBB" and studies of health effects in similar populations with similar exposures,

grading the quality of those studies as key or supportive. The Committee then performed a synthesis of key information on potential long-term health effects in military personnel potentially exposed to burn pits and developed design elements and feasibility considerations for an epidemiologic study.

The Committee's synthesis on potential long-term health effects of burn pit exposure resulted in two conclusions and several recommendations for further research. Importantly, the IOM recognized that burn pits may not be the main cause of long-term health effects related to Iraq and Afghanistan deployment. The report states, "service in Iraq or Afghanistan--that is, a broader consideration of air pollution than exposure only to burn pit emissions--might be associated with long-term health effects, particularly in susceptible (for example, those who have asthma) or highly exposed subpopulations (such as those who worked at the burn pit). Such health effects would be due mainly to high ambient concentrations of PM from both natural and anthropogenic sources, including military sources." IOM suggested the need for studies of those who deployed regardless of burn pit exposure.

Overview: VA/DoD Health Executive Council (HEC) Deployment Health Working Group (DHWG) Response and Action Plan

After careful review of the findings of the IOM report, "Long-Term Health Consequences of Exposure to Burn Pits in Iraq and Afghanistan," and consideration of other working group efforts, the HEC Deployment Health Working Group arrived at the following objectives (linked to the HEC DHWG Activities and Milestones in the FY 2011-2013 Joint Strategic Plan, see Appendix B). These objectives respond to post-deployment health concerns related to airborne hazards and the IOM Committee's conclusions on long-term health effects of burn pit exposure. Appendix C provides a prioritized list of these objectives. Appendix D links the IOM's recommendations for future research to the objectives of this Joint Action Plan and Appendix E and F provide summaries of pertinent completed, ongoing and planned research.

Activity 1: Follow-up Medical Care of Deployed Populations

Supports HEC DHWG Activity and Milestone 1

Discussion

Servicemembers and Veterans with respiratory symptoms, such as dyspnea on exertion (DOE), may have multiple causes for these symptoms. These causes may include prior disease, deconditioning, and both occupational or life-style exposures to known pulmonary irritants, such as tobacco smoke. The impact of these symptoms on individual Servicemembers and Veterans would be expected to vary and requires evaluation.

Objectives

1.1 (Protocols) – Joint DoD/VA Clinical Assessment Protocols

Case definitions and clinical evaluation protocols should be standardized across DoD and VA. The DoD-VA Deployment Health Working Group (DHWG), chartered through the Health Executive Council (HEC), should be tasked to develop expert consensus on elements of the evaluation protocols, such as standardized clinical questionnaire(s), case definitions, diagnostic algorithms and medical coding guidance. An initial effort began with the February 2010 work from the National Jewish Health Workshop, Denver, CO (established by DoD with VA participation). More recently, the Army's Public Health Command (USAPHC) drafted the Clinical Evaluation of Respiratory Conditions (CERC) questionnaire and an algorithm for evaluation of dyspnea on exertion (DOE). DoD and VA's current information systems should be utilized to record the standardized evaluation protocols.

1.2 (Transitions) – Improved Care Transitions from DoD to VA and VA to DoD with Expanded Exposure Assessment

Existing post-deployment exposure assessments (DoD Form DD2796 and DD2900) are screening level questionnaires intended to trigger follow-up evaluations. More specific task-oriented exposures are being considered for use within the DoD and VA health care systems. The DoD US Army Public Health Command's (USAPHC) Deployment Assessment of Respiratory Exposures (DARE) is one potential survey tool being evaluated. If assessments are determined to be beneficial, the tools will likely require modification for differing contexts (such as self-assessments, primary care, and specialty clinics). VA's "My Health-E-Vet" is being updated to include an exposure self-assessment with health risk communication. DoD's AHLTA and VA's VISTA Electronic Health Record should allow access to exposure assessments by clinicians.

Activity 2: Outreach and Health Risk Communication Products

Supports HEC DHWG Activity and Milestone 1

Discussion

The science and understanding of long-term health effects is expected to evolve. As new findings and opportunities for Servicemember and Veteran participation occur, outreach should be provided.

Objectives

2.1 (Stakeholders) – Improving Servicemember, Family and Veteran Knowledge of Potential and Known Health Effects

Many resources are currently available to educate Servicemembers, Veterans and their families on some of the known and potential airborne hazards associated with deployment. Resources are available via the internet on sites managed by VA's Office of Public Health (OPH), the Army Public Health Command (USAPHC), Naval and Marine Corps Public Health Center (NMCPHC) and other government entities. As information becomes available, VA and DoD should work to ensure that it is provided to the public in a format that is optimal for understanding and addresses the issues and concerns of these audiences.

In addition to posting information on websites and the use of social media, another approach will be corresponding with individuals who may have been directly affected.

2.2 (Health Care Team) – Improving Health Care Provider Understanding of Potential and Known Health Effects of Military Service

In order to ensure that the health needs of all Servicemembers and Veterans returning from deployment can be met, health care providers must be armed with the best possible information on their potential concerns. For example, the VA is working to improve post-deployment training efforts by launching a national awareness campaign to increase the visibility of their products on topics such as environmental exposures, post-traumatic stress disorder, and traumatic brain injury. These products include information on treatment, ideas to communicate to patients, and other resources to consult for further information. Additionally, to directly improve care for Veterans that may have been exposed to airborne hazards, VA will distribute a pocket card and do a number of seminars to instruct frontline providers on steps to take when seeing patients with exposure concerns.

DoD's USAPHC, which is the DoD Executive Agent for Deployment Environmental Health Surveillance, should continue its current educational efforts. For

example, the Environmental Medicine Clinical Consult Service offers direct physician-to-physician consults for patients with exposure concerns and develops factsheets for providers to communicate with Service members. DoD should continue to partner with VA where possible. DoD and VA should sponsor a joint Airborne Hazards Symposium to bring together subject matter experts, inform health care teams and develop joint action products to implement joint approaches. The symposium should occur on an annual basis as needed.

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Activity 3: Surveillance

Supports HEC DHWG Activity and Milestone 3

Discussion

The IOM's strongest health finding of "Limited/Suggestive evidence of a decrement in pulmonary function" relates to a physiologic change, which by itself is not sufficient to diagnose a specific disease or impairment. The specific impact upon an individual is likely to vary based on an individual's fitness levels, and any pre-existing illness, predispositions and the magnitude and types of exposure. In light of a recent published case-series of post-deployment dyspnea on exertion (DOE), and self-reported increases in respiratory symptoms in those who deployed, further investigation of short-term and long-term respiratory effects is warranted (King, 2011 365) (Smith, 2009 170;11). In addition, a more general surveillance is warranted to monitor for the wider range of organ system effects possible from exposure to airborne hazards (pollution).

Objectives

3.1 (Cases) – Post-deployment DOE Case Finding

A VA/DoD wide approach to enhanced case finding and assessment of post-deployment DOE and other respiratory symptoms and illnesses is the highest priority effort to better understand the scope and impact of deployment on respiratory function. DoD and VA should continue participating in joint workgroups with academia, where possible, to study and report case findings (Special Issue, 2012 Vol 54;6).

Research activities ongoing and proposed within the Military Operational Medicine Research Program (MOMRP) of U.S. Army Medical Research and Materiel Command (MRMC) are key efforts to meeting this objective. Specifically the STAMPEDE studies (Study of Active Duty Military for Pulmonary Disease related to Environmental Dust Exposure) require continued financial support. Clinical and histopathological case-series should include long-term follow-up to monitor changes in respiratory and functional status. Cases should also be followed for other potential organ effects, especially cardiovascular abnormalities. (See Appendix D for more details on these studies.)

3.2 (Cohort) – Long-Term Cohort Study of Post-Deployment Airborne Hazard Health Effects

DoD and VA should continue to support efforts to monitor all potential health effects of deployment, with particular emphasis on airborne hazards and pulmonary and cardiovascular systems. Both short and long-term (e.g. respiratory cancer) effects should be monitored.

Study objectives should encompass all potential long-term health effects of inhalational hazards (including reproductive effects). Designs should include statistical power to detect burn-pit effects, as well as, other potential airborne hazards. Pilot and feasibility studies should consider the three-tiered recommendation of the IOM in their power calculations. Focus areas should be consistent with the Environmental Protection Agency Integrated Science Assessment for Particulate Matter in 2009 [EPA/600/R-08/139F]. As more knowledge is gained, specific issues could be studied in "spin-off" studies. A nested cohort should include physical exams to look for early markers of disease and understand normal variations in the organ systems to be studied. The preferred approach is to develop an overarching cohort study. DoD and VA should work jointly to support this effort.

As recommended by the IOM, the proposed study design should be reviewed by an independent advisory body, as currently exists in the VA research program (via peer-review and the National Research Advisory Committee) and in the DoD (via the Defense Health Board).

Current studies were cited by IOM as evidence of feasibility and should be continued to address the breadth of potential health effects. First, the Millennium Cohort Study (MilCo), sponsored by DoD, includes deployment exposure questions and is investigating methodologies to determine exposure intensity around the JBB burn pit. MilCo is also investigating the feasibility of serum biomarkers as measures of exposure. VA is partnering with DoD on the MilCo to facilitate the use of VA clinical data to confirm self-reported outcomes. This collaboration is likely to improve the validity of the MilCo and the knowledge of various health effects (e.g., behavioral health) related to deployment. Second, the VA's "National Health Study for a New Generation of U.S. Veterans" has completed its first data collection and is now in the analysis phase. Self-reported exposure questions consistent with the MilCo questionnaire are included. Third, in May, 2010, the Armed Forces Health Surveillance Center (AFHSC) published a 36 month follow-up study of personnel who had been assigned to burn pit locations examining their health outcomes. The AFHSC is in the process of completing similar studies with a longer follow-up period of 48 months to identify any latent health effects that have become evident and intends to update this study annually and pursue collaboration with the VA to minimize losses to follow-up. Adjustment was made for age and previous respiratory diagnosis but the administrative data source did not allow for adjustment of smoking history. (See Appendix D for more details on these studies.)

Activity 4: Research Initiatives

Supports HEC DHWG Activity and Milestone 4

Discussion

The IOM Committee recommends further research into potential deployment-related, long-term health effects of inhalational exposures from multiple sources including pollution, dust, burn pits, and other potential toxic exposures.

IOM's conclusion was derived from long-term health studies in similar populations. There are limitations inherent in drawing conclusions about the potential health effects of deployment-related exposures from studies of non-deployed, non-military subjects. These limitations can only be addressed through studies of deployed populations and a consideration of additional potential exposures. IOM's statement that other pollution sources (e.g., PM) are of concern leads this Working Group to recommend continuing the study of airborne exposures in general and not limiting these studies to burn pit exposures. Variation in the composition of PM may impact its toxicology and should be assessed.

Objectives

4.1 (Markers) – Markers of Early Disease or Injury

The evolving science of imaging, physiologic testing, and biomarkers may be of significant value over the course of the decades during which long-term health effects should be studied. Population norms for some of these test modalities do not yet exist. Data points and samples should be taken from a subset of the planned cohort studies in order to allow retrospective data analysis of repeated samples during an individual's lifetime. Feasibility studies will be essential for less mature markers.

4.2 (Exposure) – Validated Exposure Assessment Tools

Due to the immediate need for improved exposure assessment tools, current development must rely on expert consensus between DoD, VA, and external bodies. A strategic approach is needed to identify feasible approaches to develop validated tools considering the limitations imposed by sparse or non-existent environmental sampling in prior deployments. Ongoing deployments offer a short window to perform field validation, although retrospective validation through exposure modeling is also of value.

4.3 (Toxicology) – Animal and Toxicological Studies

A wealth of information regarding the long-term effects of airborne exposures related to deployment can be gained through laboratory research using animal and alternative model systems. VA and DoD may collaborate with external research

authorities to study the mechanisms of action and subsequent health outcomes of chronic exposures to hazards encountered during deployment, such as those highlighted in the IOM study (e.g. PM, dioxins, etc). Studies in model organisms will be helpful especially in determining the cancer-causing risks of these hazards, since manifestation of the disease in humans may take a number of years. (See Appendix E for more details on these studies.)

4.4 (Modeling) – Exposure Modeling

DoD should continue to lead exposure modeling efforts with a focus on validated models based on field measurements. The continued operations of burn pits in Afghanistan offer a window of opportunity to obtain additional exposure data points.

Appendix A: References

Baird, C. (2012 54;6). Respiratory Health Status of US Army Personnel Potentially Exposed to Smoke From 2003 Al-Mishraq Sulfur PLant Fire. *J Occ Envir Med* , 717.

Department of Veterans Affairs Notice: Initial Research on the long-Term Health Consequences of Exposure to Burn Pits in Iraq and Afghanistan, Federal Register, Vol 78. No 23, Monday February 4, 2013

Desert Research Institute. *DoD Enhanced Particulate Matter Surveillance Program Final Report* . Reno, NV.

IOM. (2006). *Gulf War and Health Volume 3: Fuels, Combustion Products, and Propellants.* Washington, DC: National Academies Press.

IOM. (2011). *Long-term health consequences of exposure to burn pits in Iraq and Afghanistan.* Washington, DC: The National Academies Press.

King, M. (2011 365). Constrictive bronchiolitis in soldiers returning from Iraq and Afghanistan. *New Eng J Med* , 222-230.

NRC. (2010). *Review of the Department of Defense Enhanced Particulate Matter Surveillance Program Report.* Washington, DC: National Academies Press.

Smith, B. (2009 170;11). Newly Reported Respiratory Symptoms and Conditions Among Military Personnel. *Am J Epi* , 1433-1442.

Special Issue. (2012 Vol 54;6). *Health Effects of Deployment to Afghanistan and Iraq.* J Occup Envir Med.

USAPHC. (May 2010). *Health Assessment of 2003 Qarmat Ali Water Treatment Plant Sodium Dichromate Incident Status Update.* US Army.

Appendix B: FY 2011-2013 Joint Strategic Plan Strategic Goal 2.1 – (Quality)

HEC DHWG SMART Objective:

Coordinate joint efforts to increase health surveillance information sharing, review relevant literature on hazardous environmental exposures, and share Servicemember and Veteran health information between DoD and VA, so that situations in theater, which place these populations at risk, are identified at the earliest stage possible and DoD and VA responses are appropriately coordinated.

Activities and Milestones

1. Review DoD's identification of major environmental and occupational exposure incidents in theater, DoD's provision of data to VA, and development of appropriate DoD and VA follow-up activities, including outreach to Servicemembers and Veterans, while providing an assessment to the HEC and to other relevant stakeholders, by September 30th annually.

2. Develop and coordinate a Data Transfer Agreement for interagency approval, which will provide two-way data exchange between the DoD and VA to facilitate the identification of deployment-related hazards that could lead to long-term adverse health effects, by September 30, 2012.

3. Evaluate the 2011 Institute of Medicine report on the potential health effects of exposure to burn pits and provide an assessment of lessons learned to the HEC, related to future health surveillance, research, and possible preventive measures for future deployments, by January 1, 2012.

4. Analyze relevant research literature and government reports on deployment-related environmental exposures and provide strategic recommendations to the HEC, to mitigate and prevent the potential health effects of hazardous exposures, by September 30th annually.

Appendix C: High Priority Action Plan Objectives

Objective Number - Description	Supporting Efforts/Studies
3.1 (Cases) – Post-deployment DOE Case Finding	US Army Study of Active Duty Military for Pulmonary Disease related to Environmental Dust Exposure (STAMPEDE), NJ War Related Illness and Injury Study Center (WRIISC)
3.2 (Cohort) – Long-Term Cohort Study of Post-Deployment Airborne Hazard Health Effects	Proposed VA Office of Public Health (OPH) Study, DoD Millennium Cohort Study (MilCo), VA Study for a New Generation of Veterans (New Gen), DoD Armed Forces Health Surveillance Center (AFHSC) Cohorts
(Protocols) – Joint DoD/VA Clinical Assessment Protocols	Deployment Health Working Group with US Army Public Health Command (USAPHC), VA Office of Public Health (OPH)
2.2 (Health Care Team) – Improving Health Care Provider Understanding of Potential and Known Health Effects	Deployment Health Working Group with US Army Public Health Command (USAPHC), VA Office of Public Health (OPH)
4.2 (Exposure) – Validated Exposure Assessment Tools	US Army Public Health Command (USAPHC)

Appendix D: IOM Recommendations for Future Research with Supporting Action Plan Objectives

"A pilot [feasibility] study should be conducted to ensure adequate statistical power, ability to adjust for potential confounders, to identify data availability and limitations and develop testable research questions and specific objectives."

3.2 (Cohort) – Long-Term Cohort Study of Post-Deployment Airborne Hazard Health Effects,
4.1 (Markers) – Markers of Early Disease or Injury

"An independent oversight committee… should be established to provide guidance and to review specific objectives, study designs, protocols and results from the burn pit emissions research programs that are developed."

3.2 (Cohort) – Long-Term Cohort Study of Post-Deployment Airborne Hazard Health Effects

"A cohort study of Veterans and active duty military should be considered to assess potential long-term health effects related to burn pit emissions in the context of other ambient exposures at the JBB [Joint Base Balad]."

3.2 (Cohort) – Long-Term Cohort Study of Post-Deployment Airborne Hazard Health Effects,
4.1 (Markers) – Markers of Early Disease or Injury

"An exposure assessment for better source attribution and identification of chemicals associated with waste burning and other pollution sources at JBB should be conducted… to help the VA determine those health outcomes most likely to be associated with burn pit exposures."

4.2 (Exposure) – Validated Exposure Assessment Tools
4.3 (Toxicology) – Animal and Toxicological Studies
4.4 (Modeling) – Exposure Modeling

"Exposure assessment should include detailed deployment information including distance and direction individuals lived and worked from the JBB burn pit, duration of deployment, and job duties"

4.2 (Exposure) – Validated Exposure Assessment Tools

"Assessment of health outcomes is best done collaboratively using the clinical informatics systems of the DoD and VA."

(Protocols) – Joint DoD/VA Clinical Assessment Protocols
3.1 (Cases) – Post-deployment DOE Case Finding
3.2 (Cohort) – Long-Term Cohort Study of Post-Deployment Airborne Hazard Health Effects
4.1 (Markers) – Markers of Early Disease or Injury

Appendix E: Select Completed, Current and Planned Deployment Health Studies in Humans

Agency	Study Name and Brief Summary	Study Population	Study Design	Information Collected	Status
VA OPH	National Health Study for a New Generation of U.S Veterans (NewGen) Research Aims 1. Do veterans of OIF/OEF have an increased prevalence of health problems and behavioral risk factors following deployment in combat theaters relative to non-deployed veterans? 2. Are some health problems among deployed veterans associated with a specific exposure or experience in combat theaters?	-30,000 OIF/OEF Veterans and 30,000 Veterans who served elsewhere during same period (October 2001-June 2008) -representative of each branch -representative for component -oversample women for 20%	-Prospective Cohort -Three follow up surveys over ten years. -Self Report Survey -Medical records review of 1,000 subjects	-Health Risk Behaviors (ETOH, HIV, sexual behavior, helmet use, seatbelt use, smoking, speeding) -Health Conditions (anxiety, asthma, cancer, depression, chronic disease, CVD, IBS, PTSD, TBI, pain, migraines) -General Health (functional status, general health perception, pregnancy outcomes, reproductive health) -Health Care Utilization (doctor visits, hospitalizations, prescription drug use, CAM, VA facility use) -Potential Exposures (accidents, blasts, burn pits, chemicals, dust/sand, falls, head injury, MST, smoke, vaccinations)	-Active -22,000 participated in first wave.

Agency	Study Name and Brief Summary	Study Population	Study Design	Information Collected	Status
VA ORD	Million Veteran Program (MVP)	-1,000,000 Veterans (ideally) -Volunteer	-Prospective cohort	-Demographics (race, ethnicity, ancestry, education, marital status, income) -Family information (structure, vital status of biological family members, family medical history) -Medical history (CV, ID, MH, GI, neurological, and musculoskeletal) -Functional health status (SF-12) -Frequency of physical activity -ETOH and tobacco consumption -History of military service (period of service, location, exposure to selected deployment related agents) -Physical features -Healthcare utilization (hospitalizations, prescription use, VA usage) -Biological specimen (blood) -Past medical records	Currently enrolling

E-2

Agency	Study Name and Brief Summary	Study Population	Study Design	Information Collected	Status
DOD NHRC	Millennium Cohort Study (MilCo) Largest prospective health study in military history, designed to assess the long term health effects of military service.	-Active Duty (deployed and non deployed), Reserve, and Guard -To date 151,596 have been enrolled (still have one more panel to sample) -Oversampled for females, Marines, Married, Prior deployers (SWA, Bosnia/Kosovo after 8/97), and National Guard/Reserves -57% of sample has deployed in support of Iraq/Afghanistan since 2001 -12% include GWV -33% of sample has separated	-Prospective cohort: 21 years -Began in 2001 -Questionnaire every three years through 2022	Questionnaire includes: -Demographics -Medical conditions (including asthma, chronic bronchitis, and emphysema, shortness of breath) -Depression -Anxiety -Eating disorders -PTSD -Physical activity -Chronic pain -Health status changes -CAM -Anthrax vaccine history -ETOH use/abuse -Smoking -Deployment exposures -Occupational hazards -Job code -Does not have specific base camp information, just deployment country -Linkage to medical and military records with data on demographics, occupation, deployment, separation, vaccinations, health care utilization, pharmacy prescriptions, lost work days, employability, and mortality	On-going: 3 yr questionnaires Link to Abstract More than 30 Articles on Military Health Proposed: Examine effect of PTSD or anxiety disorder symptoms and diagnosis on respiratory symptoms and diagnoses Geographic area evaluations Explore linkages between the Millennium Cohort Study and individual exposure data; determine feasibility Examine the prognosis of incident respiratory symptoms reported by land-based deployers using the 2011-2012 survey cycle data Investigate the impact of respiratory symptoms post-deployment, including at self-reported assignment locations

E-3

Agency	Study Name and Brief Summary	Study Population	Study Design	Information Collected	Status
DOD, USAPHC	Mishraq Sulfur Fire Cohort Research Aim To assess whether or not exposure to chemicals released during the 2003 Mishraq Sulfur Fire may have caused or exacerbated any adverse health conditions among exposed personnel during or after OIF deployment	-6,532 Exposed Active Duty composed of 191 Army firefighters who extinguished the fire and 6,341 Soldiers assigned, attached to, or co-located with units that were located within 50km of Mishraq Sulfur plant during active burning-1 Jun 2003-21 Aug 2004. Majority were members of 101 DIV, either 1st Brigade Combat Unit of 326th Engineering Unit -4,153 Unexposed Active Duty Time based: 1,869 OIF/OEF Soldiers who were deployed during the year prior to or following the exposure period according to DMDC Location based: 2,284 Soldiers who were deployed for at least 1 day to Q-West area (largest established camp in that area) 14 to 24 months after burn period ended, and were not in either of the other two groups 10,685 total	Historical cohort	-Self reported health status before and after deployment (DD 2795 and 2796) -Medical encounter data	Completed. Link to Abstract Findings: -The two exposed groups had significantly more frequent self reports of fair or poor health -Exposed groups significantly more often referred for further care, significantly more reports of health concerns and exposure concerns -Exposed groups had significantly more frequent reports of runny nose, difficulty breathing, rash, tearing, and coughing during deployment. -Both exposed and unexposed had a significant increase in the percent reporting poorer health post deployment compared to pre-deployment -Incidence of respiratory diagnoses encounters decreased from pre to post deployment, but not significant. -Incidence of encounters for acute respiratory infections decreased from pre to post deployment period-and was significant in each of the groups

E-4

Agency	Study Name and Brief Summary	Study Population	Study Design	Information Collected	Status
DOD USA	A Database Registry of Military Personnel Diagnosed with Post-Deployment Chronic Pulmonary Disease Research Aim To examine the relationship between onset of chronic pulmonary disease and deployment history 2005-2009-any active duty with any disease, anyone seen at any MTF, and any back at deployment. Also, do they really have it (b/c coding is bad)?	Current number=80,000+	Retrospective database registry	Diagnoses included in this database: -asthma (those undergoing a Medical Evaluation Board (MEB) and new onset) -COPD (COPD, emphysema, chronic bronchitis) -sarcoidosis - other pulmonary interstitial/infiltrative disorders (pulmonary fibrosis, constrictive bronchiolitis) -No information on where person was stationed	MEB, COPD complete

E-5

Agency	Study Name and Brief Summary	Study Population	Study Design	Information Collected	Status
DOD USA	STAMPEDE Registry of Deployment Related Lung Disease Research Aim Establish a centralized database registry of patients diagnosed with lung disease related to deployment to OIF/EIF/OND from DOD medical treatment facilities.	Projected N=3,000 Likely members of this cohort are also members of the other STAMPEDE cohorts and other studies at Brooke Army Medical Center (most subjects are Army)	Prospective registry (with ten year follow-up).	Enrolls all patients seen at an MTF with diagnosed chronic lung disease related to deployment, including: -asthma -emphysema -chronic bronchitis -COPD -bronchiectasis -sarcoidosis -pulmonary fibrosis -constrictive bronchiolitis -other pulmonary interstitial/infiltrative disorders -Will collect clinical data for 10 years post-diagnosis -Has information on where the subject was stationed	On going

E-6

Agency	Study Name and Brief Summary	Study Population	Study Design	Information Collected	Status
DOD USA	Pre- and Post-Deployment Evaluation of Military Personnel for Pulmonary Disease Related to Environmental Dust Exposure (STAMPEDE-II) Research Aims Evaluate active duty military pre and post deployment for the development of lung disease measured by chest imaging and PFTs.	Deploying Soldiers from Ft. Hood (Predominately Army) N=1500	Prospective Study	Chest radiography, standard spirometry and impulse oscillometry pre and post deployment	First year funding obtained.
DOD USA	Study of Active Duty Military for Pulmonary Disease related to Environmental Dust Exposure (STAMPEDE) Research Aim To evaluate military personnel who have recently returned from OIF/EIF for evidence of lung disease related to prolonged environmental dust exposure in the current theaters of operation	N=50 Subjects recruited from units returning from deployment to Fort Hood (Army) within past six months with primary complaints of dyspnea.	Prospective Study	Detailed history Physical exam Risk factor assessment Complete pulmonary evaluation: -chest radiograph -high resolution CT of chest -full pulmonary function testing -impulse oscillometry -methacholine challenge testing -bronchsopy with bronchoalveolar lavage Location of unit during deployment.	Ongoing

E-7

Agency	Study Name and Brief Summary	Study Population	Study Design	Information Collected	Status
DoD/ USA DOI/ USGS/ National Jewish Health	Development of a Morphometric Approach to Quantification of Small Airways Disease and a Particulate Matter Exposure Profile in Lung Biopsies of Deployed US Military Personnel	US Military Personnel	Case-Control	Independent Pathological review of biopsy specimens and measurement of pathological features for objective diagnosis; characterization of PM in lungs	Ongoing
DoD JPC	Histopathological and chemical analytical evaluation of pulmonary specimens from US military Operation Iraqi Freedom and Enduring Freedom veterans	US Military Personnel	Case Series	Histopathology physico-chemical characterization of inhaled PM	Approved by IRB
Iraqi Military	Baseline spirometry Values for Iraqi National Military: The Impact of Chronic Dust Exposure. Study conducted by Iraqi doctor, not a DOD funded or sponsored study	Iraqi military personnel	Cross-sectional	Pulmonary questionnaire and baseline spirometry to determine baseline pulmonary function in a sample of the native population	Results will be shared with Dr. Morris

E-8

Agency	Study Name and Brief Summary	Study Population	Study Design	Information Collected	Status
DoD AFHSC	Epidemiologic studies of Health Outcomes among Troops deployed to Burn Pit Sites	Active component service members of the US Army and US Air Force who were deployed to one of four locations in CENTCOM (two with a burn pit and two without),or Korea compared to a never deployed CONUS based population	Retrospective cohort	Health care encounters during and following deployment; responses on post deployment health assessment form (2796, 2900)	Initial report (36 month follow-up) completed. Report: Link: Burn_Pit_Epi_Studies.pdf 48 month follow-up and improvement on comparison population and increased specificity of outcome definitions completed and is being drafted for release. Additional yearly follow-up of these cohorts is planned.
DoD AFHSC	Incidence of respiratory conditions among all deployers to OIF/OEF/OND	Active component service members, all services, with a deployment of >30 days where the operation was OEF/OIF/OND and a CONUS based comparison cohort	Retrospective cohort	Health care encounter with an ICD-9 coded diagnosis for a disease of the respiratory system (460-519) or a sign, symptom or ill-defined condition involving the respiratory system.	Completed; Results under preparation for publication
DoD AFHSC	Epidemiologic studies of Health Outcomes among Troops deployed to Kabul and Bagram	Active component service members deployed to one of two bases located near Kabul and Bagram, AF	Retrospective cohort	Location, electronic medical record administrative data	Currently working with DMDC to identify cohorts
DoD NHRC	Birth Outcomes Among Military Personnel After Exposure to Documented Open-Air Burn Pits Before and During Pregnancy	Active duty women and men within a 3-mile radius of select open-air burn pits	Retrospective cohort	Live births and infant health outcomes	Complete J Occ Envir Med, Vol 54;6:689-697

E-9

Agency	Study Name and Brief Summary	Study Population	Study Design	Information Collected	Status
VA OPH NJ WRIISC	Effects of Deployment Exposures on Cardiopulmonary and Autonomic Function Research Aims: 1 – Evaluate cardiopulmonary function (i.e. exercise gas exchange and spirometry) in deployed OEF/OIF Veterans versus those deployed elsewhere. 2- Determine whether deployment-related exposures alter cardiovascular autonomic control.	-OEF/OIF/OND Veterans deployed to Iraq or Afghanistan and age/gender matched Veterans of the same time period deployed elsewhere	Case-control	Physiological Assessments: 1 –Exercise Challenge 2 – Spirometry 3 – Autonomic battery Questionnaires: 1- Exposure assessment 2 – DARE 3 – CERC 4 – Health history 5 – Military history 6 – Physical activity history	Data Collection

E-10

Appendix F: Select Non Human and Toxicological Studies

Agency	Study Name and Brief Summary	Study Population	Study Design	Information Collected	Status
VA/USAF Military Working Dog Center/DoD Joint Pathology Center	Military Working Dogs (MWD) as sentinels for human disease: examining health records to identify diseases common to deployed military personnel and deployed MWDs Research Questions: These dogs were exposed to the same environmental hazards as military personnel and therefore may serve as sentinels for adverse health effects in humans	MWDs deployed to the Gulf and other regions	Cohort	MWD health records and MWD necropsy/biopsy results	Preliminary discussion with partners
DOD/USA CEHR/HHS /NIOSH	Effects of Pulmonary Exposure of Rats to Airborne Particulate Matter from Iraq	Rat	Toxicology: Intratracheal instillation of fine PM from Camp Victory	histopathology, biochemical and immunological markers of injury in lung lavage	Ongoing; limited toxicity of aerosol fine PM collected at Camp Victory

Agency	Study Name and Brief Summary	Study Population	Study Design	Information Collected	Status
DOE/Pacific Northwest Labs/ Institute for Systems Biology	Biomarkers for Pulmonary Injury Following Deployment (microRNA and protein biomarkers in lung lavage fluid and serum from rats	NIOSH rat study	Toxicology	microRNA and protein biomarkers in lung lavage fluid and serum	Ongoing
DoD/NAM RUD/USA & NC State	Biological Responses in Rats Exposed to Cigarette Smoke and Middle East Sand (Dust)	Rats	Toxicology: Inhalational exposure to Camp Victory soil:	Biochemical and immunological markers of disease in lung lavage fluid, lung gene expression, serum and lung lavage proteomics, behavioral measures, PFTs	Completed. Inhalation Toxicology, 2012; 24(2): 109–124 Limited toxicity of Camp Victory soil.
DoD/NAM RU-D	The Acute and Long-Term Effects of Middle East Sand Particles on the Rat Airway Following a Single intratracheal Instillation	Rat	Toxicology	toxicity of Camp Buehring (Kuwait) dust	Completed. J Toxicol Environ Health A. 2011;74(20):1351-65 Limited toxicity of Camp Buehring (Kuwait) dust
DoD/NAM RU-D	Studies of composition of plume from reconstituted burn-pit	Cultured cells	Toxicology	toxicity of plume to cells in culture; toxicity of plume to rats pending, chemical composition of plume	Ongoing
DoD/NAM RU-D	In vitro toxicity of SWA soils, toxicity of instilled extracts of soils	Cultured cells	Toxicology	Cell viability	Manuscript in preparation

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