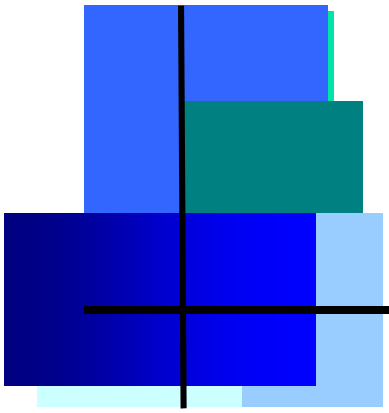
DEPARTMENT OF VETERANS AFFAIRS

ANNUAL REPORT TO CONGRESS

Federally Sponsored Research on Gulf War Veterans' Illnesses for 2012



Annual Report to Congress – FY 2012

Federally Sponsored Research on Gulf War Veterans' Illnesses for 2012

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EXECUTIVE SUMMARY

I. INTRODUCTION

Section 707 of Public Law (P.L.) 102-585, as amended by section 104 of P.L. 105-368 and section 502 of P.L. 111-163, requires that an annual report be submitted to the Senate and House Veterans' Affairs Committees on the results, status, and priorities of research activities related to the health consequences of military service in the Gulf War (GW) in Operations Desert Shield and Desert Storm; August 2, 1990 – July 31, 1991. The Research Subcommittee of the interagency Deployment Health Working Group (DHWG) prepared the Annual Report to Congress on Federally Sponsored Research on Gulf War Veterans' Illnesses for 2012, which is the 19th report on Federal research and research activities. The DHWG tracks all federally-funded research projects related to GW Veterans' illnesses (GWVI).

As in previous annual reports to Congress, the material presented is divided into six sections and three appendices. Section I is an introduction; Section II summarizes the research priorities and organization of the Federal GW research portfolio; Section III highlights and summarizes research progress published since the last annual report to Congress; Section IV summarizes Federal funding trends for GW research during the 10-year period from fiscal year (FY) 2003 through FY 2012; Section V highlights new research projects and initiatives since the last report; Section VI contains literature references; and the Appendices contain listings of federally-funded research projects.

II. RESEARCH PRIORITIES

The research priorities remain unchanged from last year. The 19 Research Topics (2 of the original 21 topics were eliminated in the 2006 annual report to Congress) are grouped into five major Research Focus Areas. These Research Focus Areas are used to organize Sections III and V, as well as Appendix B (Project Listing by Research Focus Area). In November 2005, at the request of the Secretary of Veterans Affairs, the Department of Veterans Affairs (VA) Office of Research and Development (ORD) developed a set of criteria for inclusion of VA-funded projects in the GW research portfolio and then evaluated the entire VA research portfolio for projects meeting those criteria. The criteria used as the basis for the review are presented in Section II.

III. PUBLISHED RESULTS AND STATUS OF THE FIELD IN 2012

Section III provides brief summaries of research articles on the health problems of GW Veterans published during calendar year (CY) 2012 or in CY 2011 after the previous annual report to Congress was submitted. Research results are grouped according to the five Research Focus Areas used to organize the 19 Research Topics (see Section II): Brain and Nervous System Function, Environmental Toxicology, Immune Function, Reproductive Health, and Symptoms and General Health Status. In this section, published research results are described followed by specific study abstracts taken from PubMed.

IV. RESEARCH FUNDING TRENDS

VA, the Department of Defense (DoD), and Department of Health and Human Services (HHS) funded 412 distinct projects from FY 1992 through FY 2012 related to health problems affecting GW Veterans. The scope of the Federal research portfolio is broad, from small pilot studies to large-scale epidemiology studies involving large populations and major center-based research programs. Federal funding for research on GWVI totaled approximately $230 million for the period from FY 2003 through FY 2012. As of September 30, 2012, 339 projects (85 percent of the 400 projects) were completed, and 61 projects (15 percent) were new or ongoing.

V. NEW RESEARCH PROJECTS AND INITIATIVES

Eight new projects were funded through the FY 2011 appropriation for the Gulf War Illness Research Program (GWIRP) managed by the Congressionally Directed Medical Research Programs (CDMRP) at DoD; these were not initiated until FY 2012. These projects focused on Brain and Nervous System Function (2), Immune Function (1), and Symptoms and General Health (5). VA funded four new projects in FY 2011. Three of these projects focused on Brain and Nervous System Function, and one focused on Symptoms and General Health.

I. INTRODUCTION

The Secretary of Veterans Affairs is required by section 707 of P.L. 102-585, as amended by section 104 of P.L. 105-368 and section 502 of P.L. 111-163, to submit an annual report on the results, status, and priorities of research activities related to the health consequences of military service in the GW to the Senate and House Committees on Veterans' Affairs. The Research Subcommittee of the interagency DHWG prepared this 2012 annual report to Congress, which is the 19th report on research and research activities (DHWG, 2004; DHWG, 2005; DHWG, 2006a; DHWG, 2006b; DHWG, 2007; DHWG, 2008; DHWG, 2009; DHWG, 2010; DHWG, 2011; DHWG, 2012; MVHCB, 2001; MVHCB, 2002; PGVCB, 1995; PGVCB, 1996b; PGVCB, 1997; PGVCB, 1998; PGVCB, 1999; PGVCB, 2001). The DHWG tracks all federally-funded research projects related to GWVI.

As in previous annual reports to Congress, the material presented is divided into six sections and three appendices. Section I is an introduction. Section II summarizes the research priorities and organization of the Federal GW research portfolio. Section III highlights and summarizes published research progress since the last report. Section IV summarizes Federal funding trends for GW research during the 10-year period from FY 2003 through FY 2012. Section V highlights new research projects and initiatives since the last annual report to Congress. Section VI contains literature references, and the Appendices contain listings of federally-funded research projects.

II. RESEARCH PRIORITIES

A. Nineteen Research Topics

The Persian Gulf Veterans Coordinating Board (PGVCB) was created in 1994 to coordinate research from VA, DoD, and HHS on GWVI. In 1995, the PGVCB devised a contextual framework for the results of completed and ongoing studies and also to develop an approach for the interpretation of research results. To that end, the PGVCB identified 19 major research questions and subsequently added two additional questions in 1996 (PGVCB, 1996a), to bring the total to 21. The comprehensive GW research portfolio has addressed each of these 21 questions, and relevant results have been published on each one. The Military and Veterans Health Coordinating Board (MVHCB), the successor organization to the PGVCB, conducted a comprehensive assessment of the progress made on each of these 21 questions in the 2000 annual report to Congress. The Research Subcommittee of the DHWG, which was established to address a broader range of deployment health issues, reviewed the 21 questions and replaced them with a corresponding list of 21 Research Topics for the 2004 annual report to Congress (DHWG, 2006a).

The original list of 21 questions has been reduced to 19. Based on the Institute of Medicine (IOM) of the National Academies review of the scientific literature on infectious diseases (Institute of Medicine, 2006b) and the state of our current scientific knowledge, the conclusion was reached in the 2006 annual report to Congress (DHWG, 2007) that there is no rationale to continue inclusion of infectious diseases as an area of research that

will provide answers to the causes or cure for these symptoms. Questions 2 and 19 have, therefore, been removed from the original list of 21 Questions and the third Research Focus Area has been refocused from Immune Function and Infectious Diseases to just Immune Function. Projects originally identified as "GW research" under these two questions will continue to be listed in Appendices A and B, but no funding amounts will be shown for FY 2007 or beyond.

Similarly, projects related to Post-traumatic Stress Disorder (PTSD) that were originally included in the Federal GW research portfolio were closed as of FY 2007 (i.e., no funds listed in Appendix C) if they did not directly study a population of ill GW Veterans or were not investigating treatments that may prove beneficial for ill GW Veterans.

The IOM report reviewing the available literature on amyotrophic lateral sclerosis (ALS) in Veterans (Institute of Medicine, 2006a) concluded there is limited and suggestive evidence of an association between military service and later development of ALS. This strengthens the decision to include ALS as a relevant topic in the Federal portfolio of GW research (DHWG, 2006b). ALS projects included in the GW portfolio are primarily focused on epidemiologic studies in GW Veterans and the development of new methodologies to identify and treat ALS.

B. Research Portfolio Descriptors

VA maintains a research database of federally sponsored research on GWVI. This includes research conducted by Federal scientists, as well as that by non-Federal scientists supported by Federal research funds through grants, contracts, and cooperative agreements. It is not possible to accurately track research efforts that fall within the private sector or otherwise outside of the purview of the Federal government.

Nonetheless, the Research Subcommittee of the DHWG attempts to stay abreast of all research relevant to GWVI. This is accomplished by monitoring peer-reviewed published scientific literature, attending scientific meetings, and even using newspaper reports and personal accounts of researchers.

Appendix A lists the projects that VA, DoD, and HHS have funded to date. Research projects are grouped according to the department that is responsible for funding. Dual-funded projects are listed under both departments.

Appendix B lists all federally-funded GW research projects regardless of the department providing the funding. Three descriptors are used to categorize each funded project.

The first descriptor is the primary **Research Focus Area** of the project. The five Research Focus Areas are also used to organize the 19 Research Topics (see Section A, above).

- Brain and Nervous System Function (e.g., studies on neurological or psychological deficits and/or alterations)
  - Organic neuropsychological and neurological deficits (original Question 16)
  - Psychological symptoms and/or diagnoses (original Question 18)

- Environmental Toxicology (e.g., studies focused on specific environmental exposures such as pesticides, oil well fires, jet fuel, vaccines, medical prophylactic agents, etc.)
  - Petroleum products and combustion products (original Question 3)
  - Occupational/environmental hazards (original Question 4)
  - Organophosphorus nerve agent and/or sulfur mustard from bombing at Muhammadiyat or weapons bunker at Khamisiyah (original Question 5)
  - Chemical agents, other than at Khamisiyah (original Question 6)
  - Pyridostigmine bromide (PB) and other medical prophylaxes (e.g., vaccines and anti-malarials) (original Question 7)
  - Psychophysiological stressors (original Question 8)
  - Short-term, low level exposures to PB, N, N-diethyl-m-toluamide (DEET), or permethrin, alone or in combination as a cause of short-term and/or long-term neurological effects (original Question 17)

- Immune Function (e.g., studies on alterations in immune function or host defenses)
  - Altered immune function or host defense (original Question 10)

- Reproductive Health (e.g., studies on sexual and/or reproductive dysfunction)

- Birth defects in offspring (original Question 11)
- Lower reproductive success (original Question 12)
- Sexual dysfunction (original Question 13)

- Symptoms and General Health (e.g., studies on mortality, pulmonary disease, cancer, chronic multisymptom illnesses, etc.)
  - Increased prevalence or severity of symptoms and/or illnesses (original Question 1)
  - Nonspecific symptoms and symptom complexes (e.g., chronic multisymptom illnesses (CMI)) (original Question 9)
  - Changes in lung function or airway reactivity (original Question 14)
  - Smaller baseline lung function or greater degree of nonspecific airway reactivity (original Question 15)
  - Development of cancers of any type (original Question 20)
  - Mortality rates (original Question 21)

Secondary and/or tertiary Research Focus Areas from the above list may also be assigned. Two additional Research Focus Areas may be used for secondary and tertiary assignments. This permits accounting for projects that cover multiple focus areas.

- Chemical weapons (e.g., sarin, sulfur mustard, etc.)
- PB and other medical prophylaxes (e.g., vaccines, PB, antimalarials, etc.)

The second descriptor is the **Project Focus**, categorized as follows:

- Diagnosis: studies that will improve the ability to diagnose previously unexplained conditions or to better refine diagnoses with new tools
- Exposure: studies that examine individual exposures and/or interactions of exposures (chemical, biological, pharmacological, physiological, etc.)
- Interactions: interactions of combined exposures (chemical, biological, pharmacological, physiological, etc.)
- Prevention: studies that will produce knowledge that could lead to disease prevention strategies
- Symptoms: prevalence and risk factors for symptoms and alterations in general health status
- Treatment: development or testing of new therapies

Each project is assigned up to three Project Focus areas as categorical descriptors. This allows accounting for projects that cover multiple focus areas. For example, a project on the neurophysiological effects of exposure to sarin in animals would have a focus on the brain and nervous system and a focus on chemical weapons. The number of focus areas (between one and three) assigned to a project depends on the project itself.

The third descriptor for each project is **Research Type**. Each research project on GWVI uses a method of approach to test a specific research hypothesis. Although precise categorization of research types can be difficult because of overlapping methodologies, research projects can be divided into the following general types:

MECHANISTIC: Research into underlying mechanisms of diseases and illnesses using in vitro and in vivo models.

CLINICAL: Application of an intervention, such as in a controlled drug trial, or use of methodologies such as case-control studies to define risk factors for disease.

EPIDEMIOLOGY: Study of the distribution and determinants of disease in human populations. It includes population-based studies focused on outcomes such as mortality, symptoms, hospitalizations, etc., using devices such as postal surveys, telephone interviews, and reviews of medical records.

DEVELOPMENT: In addition to tracking research on GWVI, the DHWG also tracks development activities. In general, development is the systematic use of the knowledge or understanding gained from research directed toward the production of materials; devices; systems; or methods, including design, development, and improvement of prototypes and new processes. Within the context of GWVI, the DHWG categorizes activities as development as an activity that satisfies the general definition of development described above and is directed toward new biologically based prevention, intervention, and treatment measures.

The research database on GWVI catalogs only research and development activities that either directly involve GW Veterans or answer specific questions about risk factors. An example of the latter is a research project using animal models to determine health effects of low-level chemical warfare agents. The database does not account for the vast accumulated knowledge derived from the Nation's investment in more generalized biomedical research over the past 50 years.

C. Portfolio Criteria

In November 2005, at the request of the Secretary of Veterans Affairs, the VA ORD developed a set of criteria for inclusion of VA-funded projects in the GW research portfolio. The criteria and relevant references from that analysis are presented below. These criteria are now routinely used to identify relevant research projects. New projects selected for funding must meet these criteria and are presented in Section V.

1. Studies of CMI affecting GW Veterans, including case definitions for CMI in GW Veterans and the general population.
   a) Case definitions of multisymptom illnesses affecting GW Veterans (Fukuda et al., 1998; Haley et al., 1997a; Haley et al., 1997b; Haley et al., 2002; Wolfe et al., 2002)
   b) Chronic fatigue syndrome (Dunphy et al., 2003; Eisen et al., 2005; Gray et al., 2002; The Iowa Persian Gulf Study Group, 1997; Unwin et al., 1999)
   c) Fibromyalgia (Eisen et al., 2005; The Iowa Persian Gulf Study Group, 1997)

d) Irritable bowel syndrome
(Dunphy et al., 2003; Gray et al., 2002; The Iowa Persian Gulf Study Group, 1997)
e) Multiple chemical sensitivity (MCS)
(Fiedler et al., 2004; Gray et al., 2002; The Iowa Persian Gulf Study Group, 1997)

2. Conditions and/or symptoms occurring with higher prevalence in GW Veterans
a) Fatigue
(CDC, 1995; Coker et al., 1999; Doebbeling et al., 2000; Fukuda et al., 1998; Gray et al., 1999; Haley et al., 1997b; The Iowa Persian Gulf Study Group, 1997; Unwin et al., 1999; Wolfe et al., 2002)
b) Joint and muscle pain
(CDC, 1995; Coker et al., 1999; Fukuda et al., 1998; Gray et al., 1999; Haley et al., 1997a; Haley et al., 1997b; Haley, 2003; Kang et al., 2000; Pierce, 1997; Proctor et al., 1998; The Iowa Persian Gulf Study Group, 1997; Wolfe et al., 2002)
c) Gastrointestinal complaints (dyspepsia, gastritis, diarrhea, etc.)
(Blanchard et al., 2006; CDC, 1995; Coker et al., 1999; Eisen et al., 2005; Fukuda et al., 1998; Gray et al., 2002; Haley et al., 1997b; Kang et al., 2000; Proctor et al., 1998)
d) Cognitive dysfunction (memory, attention, etc.)
(CDC, 1995; Coker et al., 1999; Fukuda et al., 1998; Gray et al., 1999; Haley et al., 1997b; Kang et al., 2000; Knoke et al., 2000; Proctor et al., 1998; The Iowa Persian Gulf Study Group, 1997; Wolfe et al., 2002)
e) Sleep disturbances
(CDC, 1995; Coker et al., 1999; Gray et al., 1999; Haley et al., 1997b; Kang et al., 2000; Knoke et al., 2000; Pierce, 1997; Proctor et al., 1998; Unwin et al., 1999; Wolfe et al., 2002)
f) Central Nervous System disorders (ALS, glioblastoma, imaging studies, etc.)
(Bullman et al., 2005; Haley, 2003; Horner et al., 2003; Weisskopf et al., 2005)
g) Headaches
(CDC, 1995; Coker et al., 1999; Fukuda et al., 1998; Gray et al., 1999; Haley et al., 1997b; Kang et al., 2000; Knoke et al., 2000; Proctor et al., 1998; Unwin et al., 1999; Wolfe et al., 2002)
h) Dermatologic conditions
(CDC, 1995; Coker et al., 1999; Eisen et al., 2005; Fukuda et al., 1998; Gray et al., 1999; Kang et al., 2000; Knoke et al., 2000; Pierce, 1997; Proctor et al., 1998; Wolfe et al., 2002)

3. Long-term health effects of potentially hazardous substances, alone and in combination, to which GW Veterans may have been exposed to during deployment
a) PB
(Abou-Donia et al., 1996; Haley et al., 1997c; Wolfe et al., 2002; Abdel-Rahman et al., 2004)
b) DEET
(Abou-Donia et al., 1996; Haley et al., 1997c; Wolfe et al., 2002; Abdel-Rahman et al., 2004)
c) Permethrin

(Abou-Donia et al., 1996; Haley et al., 1997c; Wolfe et al., 2002; Abdel-Rahman et al., 2004)
d) Oil well fire smoke
(Poirier et al., 1998; Lange et al., 2002)
e) Petroleum products (e.g., jet fuels) and combustion products
(Peden-Adam et al., 2001; Bell et al., 2005)
f) Multiple vaccinations and other medical prophylaxes
(Rook et al., 1997; Hotopf et al., 2000; Kang et al., 2000)

4. Other topics from the 19 Topics forming the framework for the *Annual Report to Congress on Federally Sponsored Research on GW Veterans' Illnesses:*
   a) Altered immune function and/or host defense
   (Zhang et al., 1999; Peden-Adam et al., 2001)
   b) Physiological responses to biological stress
   (Abdel-Rahman et al., 2004; Fiedler et al., 2004)
   c) Sexual and/or reproductive dysfunction
   (Cowan et al., 1997; Doyle et al., 1997; The Iowa Persian Gulf Study Group, 1997)

III. PUBLISHED RESULTS AND STATUS OF THE FIELD IN 2012

Since the last *Annual Report to Congress,* numerous research studies have provided new and detailed information on the health problems of GW Veterans. A PubMed search retrieved 36 relevant articles published in English in calendar year 2012 or in 2011 after the last report was submitted. These articles include federally and non-federally funded research, as well as international research. This section provides brief highlights of the published research divided into the five Research Focus Areas described in Section II. B., above, followed by the PubMed abstracts.

A. Brain and Nervous System Function

Studies relevant to Veterans of the1990-1991 GW are presented in this section if they are related to brain and nervous system function. In 2012, most of these studies focused on psychological health and cognitive function.

General Brain Function and Exposure Research

Mice that were first dosed with PB, insect repellent DEET, and insecticide permethrin then subjected to physical stress were studied with respect to the phosphatidylcholine and sphingomyelin in their brains. These mice had lipid changes relative to control mice, suggesting internal mechanisms that respond to the exposure, and thereby suggesting possible treatment targets (Abdullah et al., 2012).

A control group of healthy and ill GW Veterans categorized into three "syndromes" were tested for response to innocuous (warm) and noxious (painful) heat while being examined using functional magnetic resonance imaging (fMRI). Two of the groups of ill Veterans exhibited abnormal processing of sensory stimuli, and this may help explain the chronic

pain experienced by some GW Veterans. However, the results are preliminary and a larger study is necessary (Gopinath et al., 2012). Another study compared ill and healthy GW Veterans using a face-name associative memory test during fMRI. The ill Veterans exhibited decreased memory performance relative to the healthy controls, and fMRI data indicated differences between the two groups in the left hippocampus (Odegard et al., 2012). In a third study, a number of objective autonomic tests were used to verify the hypothesis that ill GW Veterans have cholinergic autonomic dysfunction. The autonomic symptom profile scales, sudomotor function, and high-frequency heart rate variability were significantly different from controls and patients categorized in Syndromes 1, 2, and 3 of the Haley case definition for ill GW Veterans (Haley et al., 2013).

Neuropsychological Functioning and Stress Response

The most common psychological health issue to arise from the GW was PTSD. In a study to monitor trends in treatments for PTSD and other mental disorders, Hermes et al. compared VA workload for the time periods 1997-2005 and 2005-2010. They found that the number of patients treated and the treatment intensity increased over the study's timeframe (Hermes et al., 2012).

In a study of the hypothalamic-pituitary-adrenal (HPA) axis in GW and Vietnam Veterans, it was found that adrenocorticotropic hormone (ACTH) was elevated in the PTSD-positive Veterans of the GW only. These data suggest that dysregulation of the HPA axis in GW Veterans requires additional study (Golier et al., 2012). Amygdala volumes, determined by MRI, in the brains of Vietnam and GW Veterans with and without PTSD were compared. In the groups from both conflicts, the Veterans with PTSD had larger total amygdala volumes than did the non-PTSD Veterans. The conclusions were the same when considering early childhood head trauma or combat trauma (Kuo et al., 2012). A study was designed to evaluate PTSD exposure therapy for Veterans of different wars (total of 112 Veterans from Vietnam, the GW, and Operation Enduring Freedom (OEF)/Operation Iraqi Freedom (OIF)). After prolonged exposure treatment, the Vietnam and OEF/OIF Veterans were found to respond similarly. GW Veterans did not respond at the same rate or to the same extent. This emphasizes the need for tailored PTSD treatments (Yoder et al., 2012). In a group of 1,381 Australian GW Veterans, those suffering with PTSD were found to be over 7 times more likely to have high blood pressure than those without PTSD (Abouzeid et al., 2012). Hassijia et al. evaluated the effects of combat and personal trauma on women Veterans from the GW and OEF/OIF using PTSD, depression, and alcohol abuse as indicators. Combat exposure was the only parameter which affected the three measures. It was suggested that combat exposure should be part of routine screening for returning Veterans (Hassijia et al., 2012).

In one study of hyperarousal, subjects were asked to perform tasks during gunshot and lion roar sounds (Tillman et al., 2012), and in another study, subjects were shown images associated with the 1991 GW (Tillman et al., 2013). Healthy GW Veterans constituted the control group, and ill Veterans were categorized as Syndromes 1, 2, and 3 of the Haley case definition. Both studies found that ill GW Veterans reported hyperarousal significantly

more frequently than did the controls, so it was concluded that these are due to damage to the cholinergic, dopaminergic, and white matter systems of the brain.

Veterans who served at some time between 1990 and 2007 were studied with respect to the incidence of multiple sclerosis (MS). Incidences were more than 3 times higher for females than for males, regardless of race. When comparing Blacks and Whites, the overall incidence was 1.27 times higher for Blacks. Within the individual U.S. military services, the highest incidence was in the Air Force, the lowest in the Marine Corps. Additional analysis of these data is necessary (Wallin et al., 2012), and additional research into the possible connection of MS to GW service is ongoing.

In an unrelated article from the United Kingdom, the authors describe the case of a sea captain who spent several days aboard a burning ship during the Gulf War and was later diagnosed with MS. An autopsy found that the patient also exhibited TDP-43 proteinopathy. The connection between this complicated diagnosis and the possible environmental trigger needs to be studied further (Rosenzweig et al., 2012).

B. Environmental Toxicology

Environmental agents potentially toxic to GW Veterans in theater were the topics of numerous scientific reports in 2011. These agents can be grouped into three areas: (1) depleted uranium (DU), which is used in armor-piercing munitions; (2) chemical and anti-nerve agents (e.g., mustard gas and PB); and (3) insecticides (e.g., permethrin, chlorpyrifos).

DU

Urine monitoring and health surveillance of Veterans with embedded metal fragments continues. Of particular concern are those GW Veterans with embedded DU fragments, but no clinically significant health effects have been observed (Squibb et al., 2012). DU has also been measured in semen samples from GW Veterans. Uranium levels range from “undetectable” to “very high” and correlate with the body burden of uranium in the individuals tested. Some of these Veterans have retained DU fragments (Todorov et al., 2012).

Nerve and Chemical Agents

It has been proposed that nerve agent plumes in the upper atmosphere traveled south and exposed U.S. troops and set off chemical detectors when Iraqi chemical weapons storage facilities were bombed early in the GW. It has also been suggested that epidemiological studies of GW Veterans need to be reevaluated to include alarms as a surrogate measure of exposure to nerve agents (Tuite and Haley, 2012). As a follow-up study, 8,020 GW-era Veterans were asked about chemical alarms, and they were evaluated for possible exposure to chemical weapons destroyed at Khamisiyah, Iraq. It was concluded that the symptoms in ill GW Veterans were more likely to be associated with the chemical alarms (odds ratio, 4.13) than with the Khamisiyah plume (odds ratio, 1.21) (Haley and Tuite,

2012).

When mice were exposed to low doses of the nerve agent sarin, they were found to develop chronic heart problems and problems with their autonomic nervous systems. These conditions may be related to GW Veterans' symptoms, and additional work will continue (Shewale et al., 2012). In addition to the possibility that U.S. forces were exposed to nerve agents, it has been suggested that sulfur mustard might be responsible for all GW Veterans' health problems. Recent work suggests that the mechanism involves inhibition of the cytochrome P450 system, and that this warrants further investigation as a possible cause (Brimfield, 2012).

Insecticides and Pesticides

Individual pesticides and combinations of pesticides and other chemical species have been considered to be important in many of the medical problems exhibited by GW Veterans. After exposing mice to low levels of chlorpyrifos and organophosphate pesticide for five days, it was found that hippocampal synaptic transmission in the brain decreased by 50 percent after three months, thus demonstrating that there was long-term brain damage even though there were no short-term problems (Speed et al., 2012). In a review of the effects of organophosphate exposures, several possible mechanisms of action which do not involve cholinesterase activity are described and discussed. The concern is that the traditional inhibition of cholinesterase by organophosphates cannot account for memory and cognitive problems which can occur after sub-acute exposures. Basic neuronal processes which could be interrupted are discussed along with possible treatments for these exposures (Terry, 2012).

C. Immune Dysfunction and Infectious Diseases

Broderick, et al. used a multivariate model to compare twelve biomarkers of endocrine and immune system function in three groups of patients. Twenty-six ill GW Veterans, thirteen healthy controls, and nine patients with chronic fatigue syndrome participated, and the GW Veterans could be separated from the other two groups with the sensitivity of 70 percent and specificity of 90 percent (Broderick et al., 2012). In another study, ill and healthy GW Veterans and patients with chronic fatigue syndrome were compared before, during, and after an exercise test. Microarray gene expression profiling, enzyme-linked immunosorbent assay (ELISA) tests, and flow cytometry were used to measure neuroendocrine-immune signaling and inflammatory activity. GW Veterans were determined to exhibit overexpression of exercise response mechanism and neuro-inflammatory response (Broderick, et al., 2013).

GWVI have similarities to chronic fatigue syndrome; Moss categorized these as chronic immune system processes that may be caused by reactive oxygen species. It has been further suggested that PB can produce reactive oxygen species and may be linked to the health problems facing GW Veterans (Moss, 2012). Maloney, et al. present a latent viral immune inflammatory response (LVIIR) model to explain CMI. The basis for this model is an inflammatory response to viral antigens that has deleterious effects on the nervous

system. The model also suggests that omega-3 fatty acids may decrease inflammation (Maloney et al., 2012). Israeli agreed (Israeli, 2012) with Shoenfeld and Agmon-Levin that siliconosis, GWVI, macrophagic myofasciitis syndrome, and post-vaccination phenomena should be grouped together and referred to as "autoimmune (or autoinflammatory) syndrome induced by adjuvants" (ASIA) (Shoenfeld and Agmon-Levin, 2011).

Because of the diagnosis in an OIF Veteran, Q fever has been presented as a possible cause for GWVI (Chagaris et al., 2012). The symptom set is similar, and the particular form of Q fever appears to be difficult to identify using standard laboratory tests. Chagaris et al. suggest that Q fever should be considered when treating GW Veterans.

D. Reproductive Health

Health care data for 178,766 infants born between 1998 and 2004 were reviewed to identify children with birth defects. Overall, deployed GW Veterans were no more likely to have children born with birth defects than were non-deployed Veterans. There was, however, a slight increase in the likelihood of birth defects in children born to men who were deployed for 153 to 200 days compared to those who deployed for significantly shorter times (Bukowinski et al., 2012). Al-Hadithi et al. have reviewed data for birth defects in Iraq since the Gulf War. They neither found objective evidence of increases in birth defects, nor found a connection between birth defects and exposures to depleted uranium or other environmental hazards (Al-Hadithi et al., 2012).

E. Symptoms and General Health

General Health

Delcher and Wang commented on an earlier follow-up study of GW Veterans. In the 10-year follow-up study, it was reported that deployed Veterans were more likely to have worsening health problems than were non-deployed Veterans (Li et al., 2011). It was suggested that the earlier study had not considered whether Veterans had adequate access to health care (insured vs. uninsured) or that the available amount of health care might have changed over time (Delcher and Wang, 2012).

Surveys were given to 742 Iraqi Veterans of the GW and 413 Iraqi civilians to determine if there were differences in health status in the two groups. They found that Soldiers who were closer to Kuwait had a higher prevalence of health problems than those who were farther away, and that all Veterans showed a higher prevalence than civilians (Jamil et al., 2011).

GWVI, Chronic Fatigue Syndrome, and Fibromyalgia

The prevalence of CMI in deployed GW Veterans appears to be related to a Veteran's location in the Kuwait theater of operations. For Veterans who were in Iraq and Kuwait, multisymptom illness was most strongly correlated with the use of PB tablets or being within one mile of an exploding SCUD missile. For personnel in support areas, the most

significant correlation was with pesticides (Steele et al., 2012). VA amended its regulation regarding compensation for GW Veterans. Veterans will have until December 31, 2016, to report disabilities associated with undiagnosed illnesses or medically unexplained chronic multisymptom illness (VA, 2011; VA, 2012). A study has been designed to evaluate the effectiveness of acupuncture in treating ill GW Veterans. Subjective measures of quality of life and biomarkers of inflammation and immune system function will be used in the evaluation. Patients have been recruited, and the study is ongoing (Conboy et al., 2012).

F. Abstracts from Published Research

Abdullah L, Evans JE, Bishop A, Reed JM, Crynen G, Phillips J, Pelot R, Mullan MA, Ferro A, Mullan CM, Mullan MJ, Ait-Ghezala G, Crawford FC (2012) Lipidomic Profiling of Phosphocholine Containing Brain Lipids in Mice with Sensorimotor Deficits and Anxiety-Like Features After Exposure to Gulf War Agents. Neuromolecular Med 14(4):349-361.

The central nervous system (CNS)-based symptoms of Gulf War Illness (GWI) include motor dysfunction, anxiety, and cognitive impairment. Gulf War (GW) agents, such as pyridostigmine bromide (PB), permethrin (PER), N,N-diethyl-meta-toluamide (DEET), and stress, are among the contributory factors to the pathobiology of GWI. This study characterizes disturbances in phosphocholine-containing lipids that accompany neurobehavioral and neuropathological features associated with GW agent exposure. Exposed mice received PB orally, dermal application of PER and DEET and restraint stress daily for 28 days, while controls received vehicle during this period. Neurobehavioral studies included the rotarod, open field, and Morris water maze tests. Histopathological assessments included glial fibrillary acid protein, CD45, and Nissl staining. Liquid chromatography/mass spectrometry with source collision-induced dissociation in negative and positive ionization scanning modes was performed to characterize brain phosphatidylcholine (PC) and sphingomyelin (SM). A significant increase in ether containing PC (ePC34:0, ePC36:2, and ePC36:1) or long-chain fatty acid-containing PC (38:1, 40:4, 40:2) was observed in exposed mice compared with controls. Among differentially expressed PCs, levels of those with monounsaturated fatty acids were more affected than those with saturated and polyunsaturated fatty acids. Sensorimotor deficits and anxiety, together with an increase in astrocytosis, were observed in exposed mice compared with controls. These lipid changes suggest that alterations in peroxisomal pathways and stearoyl-CoA desaturase activity accompany neurobehavioral and neuropathological changes after GW agent exposure and represent possible treatment targets for the CNS symptoms of GWI.

Abouzeid M, Kelsall HL, Forbes AB, Sim MR, Creamer MC (2012) Posttraumatic stress disorder and hypertension in Australian Veterans of the 1991 Gulf War. J Psychosom Res 72(1):33-38. (Epub 2011 Sep 21.)

OBJECTIVE: Military Veterans experience a high prevalence of psychopathologies such as posttraumatic stress disorder (PTSD). Relationships between physical and

psychological health are increasingly recognised. This study investigated associations between PTSD and hypertension in male Australian GW Veterans.

METHODS: In 2000-02, 1456 Veterans underwent medical and psychological assessments. Medical practitioners rated self-reported medical conditions as probable diagnoses, possible, unlikely or non-medical. The Composite International Diagnostic Interview (CIDI) assessed psychological symptomatology present in the 12 months preceding evaluation, and lifetime prevalence. Odds of hypertension among those with and without PTSD were calculated for each timeframe using logistic regression.

RESULTS: Analysis was restricted to the 1381 Veterans for whom CIDI and medical data were available. Hypertension was considered probable in 100 subjects (7.2 percent). Adjusted odds ratios of hypertension were 2.90 (95 percent CI 1.19-7.09) amongst Veterans with PTSD in the past 12 months and 2.27 (95 percent CI 1.01-5.10) for lifetime prevalence, compared with those without PTSD. Hypertension was over seven times more likely amongst Veterans with PTSD alone than those with no mental illness in the past 12 months.

CONCLUSIONS: Veterans with a history of PTSD had increased odds of having hypertension. Given the array of disabling psychosocial associations of PTSD, and the numerous potential clinical sequelae of hypertension, co-existence of these conditions may have implications for prevention and management at the individual, clinical, and public health policy and practice level. Early identification of PTSD in military samples may help to ameliorate longer-term adverse physical health outcomes.

Al-Hadithi TS, Al-Diwan JK, Saleh AM, Shabila NP (2012) Birth defects in Iraq and the plausibility of environmental exposure: A review. Confl Health 28;6(1):3.

An increased prevalence of birth defects was allegedly reported in Iraq in the post 1991 GW period, which was largely attributed to exposure to depleted uranium used in the war. This has encouraged further research on this particular topic. This paper reviews the published literature and provided evidence concerning birth defects in Iraq to elucidate possible environmental exposure. In addition to published research, this review used some direct observation of birth defects data from Al-Ramadi Maternity and Paediatric Hospital in Al-Anbar Governorate in Iraq from1st July 2000 through 30th June 2002. In addition to depleted uranium other war-related environmental factors have been studied and linked directly or indirectly with the increasing prevalence of birth defects. However, the reviewed studies and the available research evidence do not provide a clear increase in birth defects and a clear indication of a possible environmental exposure, including depleted uranium although the country has been facing several environmental challenges since 1980.

Brimfield AA (2012) Chemicals of military deployments: revisiting Gulf War Syndrome in light of new information. Prog Mol Biol Transl Sci 112:209-230.

Despite the amount of hard work that has gone into elucidating a toxicological basis for GWI, we do not appear to have reached a mechanistic understanding. Investigation of long-term low-level exposure as a basis does not seem to have provided an answer. Nor does the deployment-related toxic soup idea, where exposure to a mixture of toxic chemicals not usually encountered in the same physical vicinity, seems to have explained the symptoms developed by GW Veterans. The idea that an overabundance of CNS acetylcholine leftover from excessive cholinesterase inhibition is at the basis of this syndrome is intellectually appealing and offers a level of neurochemical complexity that may be just beyond the reach of our technical understanding. But no one has yet assembled a coherent mechanism from it either. It seems reasonable that chemical warfare agents were involved. They were not included in early work because it was felt that the toxicant plumes produced during the destruction of stockpiled Iraqi chemical weapons had not been large enough to cause an exposure of US forces and those of our allies. That misconception was disproven, and it is now accepted that people could very well have been exposed to low levels of massive quantities of sarin, cyclosarin, and sulfur mustard. It also seems reasonable that excess acetylcholine or neurological consequences of its presence that we do not fully understand were involved. The combination of nerve agents and the insecticidal anticholinesterases plus the pyridostigmine bromide given prophylactically were probably sufficient to cause the problem. However, the most notable thing is the result of recent work on the toxic mechanism of sulfur mustard showing that it can inhibit the microsomal electron transport chain as a result of sulfonium ion reduction to carbon free radicals by NADPH-cytochrome P450 reductase. This information was not available during the work on GWI. So this provides an opportunity to discuss the effects of the general inhibition of the cytochrome P450 system superimposed on the conditions encountered by the participants in Desert Storm and Desert Shield as an approach to the toxicology of mixtures.

Broderick G, Ben-Hamo R, Vashishtha S, Efroni S, Nathanson L, Barnes Z, Fletcher MA, Klimas N (2013) Altered immune pathway activity under exercise challenge in Gulf War Illness: an exploratory analysis. Brain Behav Immun 28:159-169. (Epub 2012 Nov 29.)

Though potentially linked to the basic physiology of stress response we still have no clear understanding of GWI, a debilitating illness presenting with a complex constellation of immune, endocrine and neurological symptoms. Here we compared male GWI (n=20) with healthy Veterans (n=22) and subjects with chronic fatigue syndrome/myalgic encephalomyelitis (CFS/ME) (n=7). Blood was drawn during a Graded eXercise Test (GXT) prior to exercise, at peak effort (VO2 max) and 4-h post exercise. Affymetrix HG U133 plus 2.0 microarray gene expression profiling in peripheral blood mon onuclear cells (PBMCs) was used to estimate activation of over 500 documented pathways. This was cast against ELISA-based measurement of 16 cytokines in plasma and flow cytometric assessment of lymphocyte populations and cytotoxicity. A 2-way ANOVA corrected for multiple comparisons (q statistic <0.05) indicated significant increases in neuroendocrine-

immune signaling and inflammatory activity in GWI, with decreased apoptotic signaling. Conversely, cell cycle progression and immune signaling were broadly subdued in CFS. Partial correlation networks linking pathways with symptom severity via changes in immune cell abundance, function and signaling were constructed. Central to these were changes in IL-10 and CD2+ cell abundance and their link to two pathway clusters. The first consisted of pathways supporting neuronal development and migration whereas the second was related to androgen-mediated activation of NF-κB. These exploratory results suggest an over-expression of known exercise response mechanisms as well as illness-specific changes that may involve an overlapping stress-potentiated neuro-inflammatory response.

Broderick G, Fletcher MA, Gallagher M, Barnes Z, Vernon SD, Klimas NG (2012) Exploring the diagnostic potential of immune biomarker coexpression in Gulf War illness. Methods Mol Biol 934:145-164.

Complex disorders like GWI often defy diagnosis on the basis of a single biomarker and may only be distinguishable by considering the coexpression of multiple markers measured in response to a challenge. We demonstrate the practical application of such an approach using an example where blood was collected from 26 GWI, thirteen healthy control subjects, and 9 unhealthy controls with Chronic Fatigue at three points during a graded exercise challenge. A 3-way multivariate projection model based on 12 markers of endocrine and immune function was constructed using a training set of n = 10 GWI and n = 11 healthy controls. These groups were separated almost completely on the basis of two coexpression patterns. In a separate test set these same features allowed for discrimination of new GWI subjects (n = 16) from unhealthy (n = 9) and healthy control subjects with a sensitivity of 70 percent and a specificity of 90 percent.

Bukowinski AT, Descisciolo C, Conlin AM, K Ryan MA, Sevick CJ, Smith TC (2012) Birth defects in infants born in 1998-2004 to men and women serving in the U.S. military during the 1990-1991 Gulf War era. Birth Defects Res A Clin Mol Teratol 94(9):721-8. (Epub 2012 Aug 18.)

BACKGROUND: Concerns about reproductive health persist among U.S. military members who served in the 1990-1991 Gulf War. This study explores the long-term impact of 1990-1991 GW deployment on the prevalence of birth defects among infants of GW Veterans.

METHODS: Health care data from the DOD Birth and Infant Health Registry and demographic and deployment information from the Defense Manpower Data Center were used to identify infants born between 1998 and 2004 to both male and female 1990-1991 GW Veterans. Multivariable logistic regression models estimated the adjusted odds of any birth defect and eight specific birth defects among infants of deployers versus non-deployers. In addition, birth defects were evaluated among infants born to 1990-1991 GW Veterans with deployment-specific exposures.

RESULTS: Among 178,766 infants identified for these analyses, 3.4 percent were diagnosed with a birth defect in the first year of life. Compared to infants of non-deployers, infants of deployers were not at increased odds of being diagnosed with a birth defect, or any of eight specific birth defects, in the first year of life. A slightly increased prevalence of birth defects was observed among infants born to men who deployed to the 1990-1991 GW for 153 to 200 days compared to those who deployed for 1 to 92 days. No other deployment-specific exposures were associated with birth defects in these infants.

CONCLUSIONS: The 1990-1991 Gulf War deployers, including those with specific exposures of concern, were not found to be at increased risk for having infants with birth defects 7 to 14 years after deployment.

Chagaris MJ, Smith RC, Goldstein AL (2012) Immunoglobulin M and immunoglobulin G seronegative Q fever: a Hypothesis for Veterans' Medically unexplained chronic multi-symptom illnesses. J Spec Oper Med 12(1):37-48.

We present Q fever as a credible hypothesis for GWVI and as a possible etiology for prevalent symptomologies affecting currently serving servicemembers. Q fever is caused by the bacteria Coxiella burnetii, which is endemic throughout the Middle East. Q fever may manifest in many forms of widely varying and often inconstant symptoms. Due to false-negative interpretations in current and past diagnostic testing, Q fever has not received appropriate consideration as a possible causative agent for medically unexplained Veterans' illnesses. Review of current literature invites us to consider that a form of Q fever involving an incomplete immune response is a potential cause of these debilitating illnesses. We hypothesize C. burnetii infection coincidental to exposures suppressing antibody-specific immune response results in infection mediated by immunoglobulin D (IgD). Literature indicates that successful treatment for this form of Q fever requires the concurrent administration of doxycycline and hydroxychloroquine.

Conboy L, St John M, Schnyer R (2012) The effectiveness of acupuncture in the treatment of Gulf War Illness. Contemp Clin 33(3):557-562. (Epub 2012 Feb 10.)

INTRODUCTION: It can be challenging to study complex and novel health states within the parameters of a RCT. This report describes the use of an unblinded Phase II Clinical Trial design to investigate the effectiveness of acupuncture in the treatment of GWI. GWI is a complex illness found among Veterans of the first GW, and is characterized by multiple symptoms, including fatigue, sleep and mood disturbances, cognitive dysfunction, and musculoskeletal pain. No published trials of acupuncture for the treatment of GWI exist. This trial is designed to both answer questions of the effectiveness of acupuncture for our entire sample, as well as subgroups with of individual presentations of GWI.

MATERIALS AND METHODS: Our primary outcome is quality of life as measured by the SF-36. In an effort to better understand this complex disease and its treatment, our multi-level measurement plan examines psychosocial variables, fatigue, sleep quality, pain, and biomarkers of inflammation and immune status. All of the measurement instruments used in this trial show good validity and reliability.

RESULTS: This study is ongoing and clinical results are not available. We have achieved good feasibility of our recruitment, treatment, and data collection procedures.

CONCLUSIONS: Low constraint RCT designs are an appropriate choice when investigating conditions in which the causes and mechanisms of disease are poorly understood. This naturalistic RCT includes individualized protocols, a clinically supported length and dose of treatment, a wait list control arm, and the ethical benefit that all subjects receive treatment during the study.

Delcher C, Wang Y (2012) Re: "Longitudinal health study of US 1991 GW Veterans: changes in health status at 10-year follow-up." Am J Epidemiol 175(5):473; author reply 473-4. (Epub 2012 Feb 3.) (Letter.)

Department of Veterans Affairs (2011) Extension of statutory period for compensation for certain disabilities due to undiagnosed illnesses and medically unexplained chronic multi-symptom illnesses. Interim final rule. Fed Regist 76(250):81834-81836. (Published in 2011, but appeared in Index Medicus in 2012)

VA is issuing this interim final rule to amend its adjudication regulation regarding compensation for disabilities suffered by Veterans who served in the Southwest Asia Theater of Operations during the Persian Gulf War. This amendment is necessary to extend the period during which disabilities associated with undiagnosed illnesses and medically unexplained chronic multi-symptom illnesses must become manifest in order for a veteran to be eligible for compensation.

Department of Veterans Affairs (2012) Extension of statutory period for compensation for certain disabilities due to undiagnosed illnesses and medically unexplained chronic multi-symptom illnesses. Final rule. Fed Regist 77(200):63225-63228.

VA is issuing this final rule to affirm an amendment to its adjudication regulation regarding compensation for disabilities experienced by Veterans who served in the Southwest Asia Theater of Operations during the Persian Gulf War. This amendment is necessary to extend the period during which disabilities associated with undiagnosed illnesses and medically unexplained chronic multi-symptom illnesses must become manifest in order for a veteran to be eligible for compensation. Additionally, in this final rule, VA will correct the adjudication section title that was amended and published in the Federal Register on September 29, 2010, but inadvertently changed to the original title.

Golier JA, Caramanica K, Yehuda R (2012) Neuroendocrine response to CRF stimulation in Veterans with and without PTSD in consideration of war zone era. Psychoneuroendocrinology 37(3):350-357. (Epub 2011 Aug 2.)

BACKGROUND: Alterations in hypothalamic-pituitary-adrenal (HPA) axis activity have been observed in GW Veterans with posttraumatic stress disorder (PTSD) which differ from those observed in other veteran groups, raising the possibility that there is a unique neuroendocrine profile in this group of Veterans. This study seeks to further characterize

the effects of PTSD, military cohort (Vietnam, 1991 Gulf War, Operations Enduring Freedom/Iraqi Freedom (OEF/OIF)), and their interaction on the neuroendocrine response to synthetic corticotrophin-releasing factor (CRF) stimulation.

METHODS: Fifty-one male Veterans were studied consisting of 21 from the Vietnam era, 16 from the Gulf War era, and 14 from the OEF/OIF era. Sixteen of these Veterans were deployed to a war zone and had chronic PTSD (PTSD+), 25 were deployed to a war zone and did not have chronic PTSD (PTSD-), and 10 were not deployed to a war zone and did not have PTSD (non-exposed). The participants underwent the CRF stimulation test in the afternoon (approximately 2:00 p.m.), which measures the integrity and sensitivity of the pituitary-adrenal axis. Plasma cortisol and adrenocorticotropic hormone (ACTH) were measured at baseline and at intervals over a 2h period following intravenous administration of 1 µg/kg of ovine CRF (o-CRF, max 100 µg). In a small subset of participants, dehydroepiandrosterone (DHEA) and cortisol binding globulin (CBG) were also assessed.

RESULTS: There was a significant group by era interaction in the response of ACTH to CRF, in addition to a main effect of group (PTSD+, PTSD-, non-exposed). The interaction reflected that group differences were only evident in the GW cohort; among GW era Veterans, the PTSD+ group had higher elevations in ACTH levels following CRF than the PTSD- group and the non-exposed group. Additionally, the peak change in ACTH was associated with a self-reported environmental exposure (pyridostigmine bromide ingestion) which has been found to be linked to the excess morbidity found in GW Veterans. Self-reported childhood trauma was greater in Veterans of the GW than Vietnam or OEF/OIF, but did not account for the observed differences. There was a significant effect of group on the cortisol response to CRF, reflecting greater responsivity in both of the deployed groups (PTSD+ and PTSD-) compared to the non-exposed group which could be accounted for by baseline differences in cortisol levels; unlike the ACTH response, the cortisol response did not differ by era. There were no effects of group, era, or their interaction on the DHEA and CBG response to CRF.

CONCLUSIONS: A uniform pattern of PTSD-related alterations in the response to intravenous CRF was not found. Rather, PTSD-related alterations were found only in Veterans of the 1991 Gulf War, and were characterized by an enhanced pituitary response to CRF which may reflect increased sensitivity of pituitary corticotrophs or CRF hyposecretion. Together with previous neuroendocrine findings, the data suggest the HPA axis is dysregulated in GW Veterans in unique ways which may reflect the long-term effects of environmental exposures in addition to disease effects. Further work is needed to characterize these effects and their impact on long-term psychological and medical outcomes.

Gopinath K, Gandhi P, Goyal A, Jiang L, Fang Y, Ouyang L, Ganji S, Buhner D, Ringe W, Spence J, Biggs M, Briggs R, Haley R (2012) fMRI reveals abnormal central processing of sensory and pain stimuli in ill GW Veterans. Neurotoxicology 33(3):261-271. (Epub 2012 Feb 4.)

Many Veterans, chronically ill from the 1991 Gulf War, exhibit symptoms of altered sensation, including chronic pain. In this study of 55 Veterans of a Construction Battalion previously examined in 1995-1996 and 1997-1998, brain activation to innocuous and noxious heat stimuli was assessed in 2008-2009 with a quantitative sensory testing fMRI protocol in control Veterans and groups representing three syndrome variants. Testing outside the scanner revealed no significant differences in warm detection or heat pain threshold among the four groups. In the fMRI study, Syndrome 1 and Syndrome 2, but not Syndrome 3, exhibited hypo-activation to innocuous heat and hyper-activation to noxious heat stimuli compared to controls. The results indicate abnormal central processing of sensory and painful stimuli in 2 of 3 variants of GWI and call for a more comprehensive study with a larger, representative sample of Veterans.

Haley RW, Charuvastra E, Shell WE, Buhner DM, Marshall WW, Biggs MM, Hopkins SC, Wolfe GI, Vernino S (2013) Cholinergic autonomic dysfunction in Veterans with Gulf War illness: confirmation in a population-based sample. JAMA Neurol. 70(2):191-200. (Epub 2012 Nov 26.)

Abstract: BACKGROUND: The authors of prior small studies raised the hypothesis that symptoms in Veterans of the 1991 Gulf War, such as chronic diarrhea, dizziness, fatigue, and sexual dysfunction, are due to cholinergic autonomic dysfunction.

OBJECTIVE: To perform a confirmatory test of this prestated hypothesis in a larger, representative sample of GW Veterans.

DESIGN: Nested case-control study.

SETTING: Clinical and Translational Research Center, University of Texas Southwestern Medical Center, Dallas.

PARTICIPANTS: Representative samples of GW Veterans meeting a validated case definition of Gulf War illness with 3 variants (called syndromes 1-3) and a control group, all selected randomly from the US Military Health Survey.

MAIN OUTCOME MEASURES: Validated domain scales from the Autonomic Symptom Profile questionnaire, the Composite Autonomic Severity Score, and high-frequency heart rate variability from a 24-hour electrocardiogram.

RESULTS: The Autonomic Symptom Profile scales were significantly elevated in all 3 syndrome groups ($P < .001$), primarily due to elevation of the orthostatic intolerance, secretomotor, upper gastrointestinal dysmotility, sleep dysfunction, urinary, and autonomic diarrhea symptom domains. The Composite Autonomic Severity Score was also higher in

the 3 syndrome groups (P= .045), especially in syndrome 2, primarily due to a significant reduction in sudomotor function as measured by the Quantitative Sudomotor Axon Reflex Test, most significantly in the foot; the score was intermediate in the ankle and upper leg and was nonsignificant in the arm, indicating a peripheral nerve length-related deficit. The normal increase in high-frequency heart rate variability at night was absent or blunted in all 3 syndrome groups (P< .001).

CONCLUSION: Autonomic symptoms are associated with objective, predominantly cholinergic autonomic deficits in the population of GW Veterans.

Haley RW, Tuite JJ (2012) Epidemiologic Evidence of Health Effects from Long-Distance Transit of Chemical Weapons Fallout from Bombing Early in the 1991 Persian Gulf War. Neuroepidemiology 40(3):178-189.

BACKGROUND: Military intelligence data published in a companion paper explain how chemical fallout from U.S. and Coalition bombing of Iraqi chemical weapons facilities early in the air campaign transited long distance, triggering nerve agent alarms and exposing U.S. troops. We report the findings of a population-based survey designed to test competing hypotheses on the impact on chronic GWI of nerve agent from early-war bombing versus post-war demolition.

METHODS: The U.S. Military Health Survey performed computer-assisted telephone interviews of a stratified random sample of GW-era Veterans (n = 8,020). Early-war exposure was measured by having heard nerve agent alarms and post-war exposure, by the computer-generated plume from the Khamisiyah demolition. GWI was measured by two widely published case definitions.

RESULTS: The OR (95 percent CI) for the association of alarms with the Factor case definition was 4.13 (95 percent CI 2.51-6.80) compared with 1.21 (95 percent CI 0.86-1.69) for the Khamisiyah plume. There was a dose-related trend for the number of alarms (p(trend) < 0.001) but not for the number of days in the Khamisiyah plume (p(trend) = 0.17).

CONCLUSIONS: Exposure to low-level sarin nerve agent in fallout from bombing early in the air campaign contributed more to chronic illness than post-war demolition.

Hassija CM, Jakupcak M, Maguen S, Shipherd JC (2012) The influence of combat and interpersonal trauma on PTSD, depression, and alcohol misuse in U.S. Gulf War and OEF/OIF women Veterans. J Trauma Stress 25(2):216-219.

The present study evaluated the impact of combat and interpersonal trauma exposure in a sample of 115 U.S. women Veterans from Gulf War I and the Iraq and Afghanistan wars on 3 postdeployment trauma-related mental health outcomes: posttraumatic stress disorder symptoms (PSS), depressive symptom severity (DSS), and alcohol misuse. Patients presenting for health care services at a Veterans Affairs post-deployment health specialty clinic, completed screening questionnaires that assessed combat exposure,

lifetime interpersonal trauma history of childhood neglect, physical, or sexual abuse, and adult sexual and physical assault. In a regression model, combat exposure was the only significant independent variable associated with PSS, DSS, and alcohol misuse (β = .42, .27 and B = 1.58, respectively) even after adding lifetime interpersonal assault exposure to the model. Results highlight the negative effects of combat exposure on treatment-seeking women Veterans' postdeployment mental health. Incorporating combat exposure into routine screening procedures for GW and Iraq and Afghanistan war women Veterans can aid in mental health treatment planning.

Hermes ED, Rosenheck RA, Desai R, Fontana AF (2012) Recent Trends in the Treatment of Posttraumatic Stress Disorder and Other Mental Disorders in the VHA. Psychiatr Serv 63(5):471-476.

OBJECTIVE: This study proposed to evaluate the Veterans Health Administration (VHA) specialty mental health care workload for treating PTSD and other mental disorders between 2005 and 2010 in comparison with results from 1997 to 2005. The 2005-2010 time frame represents a period of increased utilization of services by recently returning Veterans and of program expansion within VHA.

METHODS: VHA administrative databases were queried for all Veterans receiving specialty mental health treatment annually between 2005 and 2010. Veterans were categorized by military service era (WWII or Korea, Vietnam, post-Vietnam, Persian Gulf War [including operations in Iraq and Afghanistan], and peacetime or other), diagnosis (PTSD or a non-PTSD mental disorder), and deployment to Iraq or Afghanistan.

RESULTS: The total number of Veterans served per year increased by 623,326 (117.6 percent) between 1997 and 2010. Veterans with PTSD increased at a greater rate since 2005 compared with Veterans with other mental disorders. Vietnam Veterans constituted a majority of all Veterans treated for PTSD or for other mental disorders, and the number of Vietnam Veterans treated for PTSD continues to grow. The number of visits per Veteran with PTSD increased between 2006 and 2010, reversing previous trends. The rate of increase has been highest for Iraq and Afghanistan Veterans.

CONCLUSIONS: Both the number treated and treatment intensity have increased for Veterans with PTSD who served in current conflicts, which might be expected, and in the Vietnam era, now 30 years past. A reversal of past declines in treatment intensity coincides with an increase in PTSD treatment funding and program expansion since 2005.

Israeli E (2012) Gulf War syndrome as a part of the autoimmune (autoinflammatory) syndrome induced by adjuvant (ASIA). Lupus 21(2):190-194.

Gulf War syndrome (GWS) is a multi-symptom condition comprising a variety of signs and symptoms described in the literature, which not been fully resolved. The various symptoms of the condition include muscle fatigue and tiredness, malaise, myalgia, impaired cognition, ataxia, diarrhoea, bladder dysfunction, sweating disturbances, headaches, fever, arthralgia, skin rashes, gastrointestinal, and sleep disturbances. In

addition, excessive chemical sensitivity and odour intolerance is reported. The aetiology of the condition is unclear, but many reviews and epidemiological analyses suggest association with pyridostigmine bromide (PB), certain vaccination regimes, a variety of possible chemical exposures, including smoke from oil-well fires or depleted uranium from shells, as well as physical and psychological stress. Recently, Shoenfeld et al. suggested that four conditions--siliconosis, macrophagic myofaciitis (MMF), GWS and post-vaccination phenomena--that share clinical and pathogenic resemblances, may be incorporated into common syndrome called “Autoimmune (Autoinflammatory) Syndrome induced by Adjuvants” (ASIA). Symptoms and signs of the four conditions described by Shoenfeld et al. show that at least eight out of ten main symptoms are in correlation in all four conditions. Namely, myalgia, arthralgias, chronic fatigue, neurological cognitive impairment, gastrointestinal symptoms, respiratory symptoms, skin manifestations and appearance of autoantibodies. Regardless of the aetiology of GWS, be it exposure to environmental factors or chemical drugs, vaccinations or the adjuvants in them, GWS fits well with the definition of ASIA and is included as part of “Shoenfeld's syndrome.”

Jamil H, Hamdan TA, Grzybowski M, Arnetz BB (2011) Health effects associated with geographical area of residence during the 1991 Gulf War: a comparative health study of Iraqi soldiers and civilians. US Army Med Dep J Jul-Sep:87-96.

CONTEXT: Although Iraqis sustained the gravest exposure conditions during the 1991 Gulf War (GW), little is known about the possible relationship between environmental exposures during the GW and long-term health in Iraqis.

OBJECTIVE: To study the relationship between distance from Kuwait during the GW and somatic health among Iraqi Soldiers vs. civilians.

METHODS: A survey questionnaire was distributed to a sample of 742 GW Veterans and 413 civilians in Iraq. The odds ratios were calculated for somatic disorders as a function of distance from Kuwait during the GW, as well as a self-reported environmental exposure index.

RESULTS: Soldiers reported a significantly higher prevalence of somatic disorders as compared to civilians. Soldiers closest to Kuwait reported significantly more somatic disorders as compared to Soldiers deployed further away from Kuwait.

CONCLUSION: Iraqi GW Veterans are at an increased risk of numerous somatic disorders. Soldiers are at an increased risk compared to civilians, suggesting that war-associated exposures are of etiologic relevance.

Kuo JR, Kaloupek DG, Woodward SH (2012) Amygdala Volume in Combat-Exposed Veterans With and Without Posttraumatic Stress Disorder: A Cross-sectional Study. Arch Gen Psychiatry 69(10):1080-1086.

CONTEXT: Data from animal models demonstrate a link between stress exposure and hypertrophic changes in the amygdala; however, studies of adults with posttraumatic stress disorder (PTSD) have failed to find analogous structural alterations.

OBJECTIVES: To compare amygdala volumes between a sample of combat Veterans with and without PTSD (analysis 1) and examine whether our observation of larger amygdala volume in individuals with PTSD could be accounted for by the presence of trauma exposure in childhood and the severity of combat exposure in adulthood (analysis 2).

DESIGN: Cross-sectional magnetic resonance imaging.

SETTING: Veterans Affairs Palo Alto Health Care System Inpatient Trauma Recovery Program and Veterans Affairs New England Health Care System Outpatient PTSD program.

PARTICIPANTS: Ninety-nine combat-exposed Veterans from the Vietnam Conflict or the Persian Gulf War who had been exposed to substantial military operational stress.

MAIN OUTCOME MEASURES: Amygdala volume adjusted for total cerebral volume, Life Events Checklist, and the Combat Exposure Scale.

RESULTS: Analysis 1 indicated that combat-exposed individuals with PTSD exhibited larger total amygdala volume compared with their non-PTSD counterparts (99 individuals, P = .047). Analysis 2 indicated that greater severity of combat exposure (87 individuals, P = .02), as well as the interaction between the presence of early life trauma and the severity of combat exposure (87 individuals, P = .008), were significantly associated with smaller total amygdala volume. The PTSD diagnosis continued to explain larger amygdala volume (87 individuals, P = .006).

CONCLUSIONS: PTSD is associated with enlarged amygdala volume, above the variance accounted for by a history of early life trauma and severity of adult trauma exposure. The discrepancy between our and prior findings may be explained by variability in these trauma indices in previous investigations. These findings support additional study of amygdala structure in human stress disorders and further delineation of the role of early and adult trauma on associated neurologic changes.

Maloney CD, Jensen S, Gil-Rivas V, Goolkasian P (2013) Latent viral immune inflammatory response model for chronic multisymptom illness. Med Hypotheses 80(3):220-229. (Epub 2012 Dec 21.)

A latent viral immune inflammatory response (LVIIR) model is presented which integrates factors that contribute to chronic multisymptom illness (CMI) in both the veteran and civilian populations. The LVIIR model for CMI results from an integration of clinical experience with a review of the literature in four distinct areas: (1) studies of idiopathic multisymptom illness in the veteran population including two decades of research on Gulf War I Veterans with CMI; (2) new evidence supporting the existence of chronic inflammatory responses to latent viral antigens and the effect these responses may have on the nervous system; (3) recent discoveries concerning the role of vitamin D in maintaining normal innate and adaptive immunity including suppression of latent viruses and regulation of the immune inflammatory response; and (4) the detrimental effects of extreme chronic repetitive stress (ECRS) on the immune and nervous systems. The LVIIR model describes the pathophysiology of a pathway to CMI and presents a new direction for the clinical assessment of CMI that includes the use of neurological signs from a physical exam, objective laboratory data, and a new proposed latent viral antigen-antibody imaging technique for the peripheral and central nervous system. The LVIIR model predicts that CMI can be treated by a focus on reversal of immune system impairment, suppression of latent viruses and their antigens, and healing of nervous system tissue damaged by chronic inflammation associated with latent viral antigens and by ECRS. In addition, the LVIIR model suggests that maintaining optimal serum 25 OH vitamin D levels will maximize immune system suppression of latent viruses and their antigens and will minimize immune system inflammation. This model also emphasizes the importance of decreasing ECRS to improve immune system function and to minimize nervous system injury from excess serum glucocorticoid levels. The proposed model supports growing evidence that increasing omega 3 essential fatty acid levels in nervous system tissues may decrease inflammation in the nervous system and improve neural plasticity and recovery from neuronal injury.

Moss JL (2012) Gulf War illnesses are autoimmune illnesses caused by reactive oxygen species which were caused by nerve agent prophylaxis. Med Hypotheses 79(2):283-284. (Epub 2012 May 24.)

GWI share many of the features of chronic fatigue syndrome (CFS) and both CFS and GWI may be the result of chronic immune system processes. The main suspected cause for GWI, the drug pyridostigmine bromide (PB), has been shown to cause neuronal damage from reactive oxygen species (ROS). ROS have been associated with IgM mediated autoimmune responses against ROS induced neoepitopes in depressed patients and this may also apply to CFS. It therefore follows that the drug used in the GW caused ROS, the ROS modified native molecules, and that this trigged the autoimmune condition we refer to as Gulf War illnesses. Similar mechanisms may apply to other autoimmune illnesses.

Odegard TN, Cooper CM, Farris EA, Arduengo J, Bartlett J, Haley R (2012) Memory impairment exhibited by Veterans with Gulf War Illness. Neurocase (Epub 2012 Apr 23, ahead of print.)

Roughly 26-32 percent of U.S. Veterans, who served in the first GW, report suffering from chronic health problems (Golomb, 2008 , Proceedings of the National Academies of Science, 105, 4295). The present study investigated the memory deficits reported by these ill GW Veterans (GWV) using a face-name associative memory paradigm administered during functional magnetic resonance imaging (fMRI). The fMRI data confirmed memory performance on the memory task to be related to the amount of activation in the left hippocampus observed during the study. In addition, ill-GWV demonstrated decreased memory performance relative to unaffected GWV on this memory test, providing evidence of memory deficits using an objective measure of memory.

Rosenzweig I, Bodi I, Nashef L (2012) Comorbid Multiple Sclerosis and TDP-43 Proteinopathy in a Gulf War Sea Captain. J Neuropsychiatry Clin Neurosci 24(1):E41-E42. (Letter.)

Shewale SV, Anstadt MP, Horenziak M, Izu B, Morgan EE, Lucot JB, Morris M (2012) Sarin causes autonomic imbalance and cardiomyopathy: an important issue for military and civilian health. J Cardiovasc Pharmacol. 60(1):76-87.

Sarin, a lethal chemical nerve agent, may be a causative factor in multifactorial syndrome implicated in the GW and Tokyo terrorist attacks. Although a high dose results in seizure and death, low-dose exposure may lead to autonomic imbalance and chronic cardiac pathologies. In this study, echocardiography and electrocardiography were used to examine the late-onset effects of a low-dose sarin on cardiac structure and function in mice. Adrenal corticosterone and tyrosine hydroxylase mRNA levels were measured. Stress responsiveness of the hypothalamic-pituitary-adrenal (HPA) axis was also tested. Findings demonstrate changes consistent with a dilated cardiomyopathy, including left ventricular dilatation, reduced contractility, and altered electrophysiological and inotropic responses to β-adrenergic stimulation. Results also indicate reduced adrenal tyrosine hydroxylase mRNA, corticosterone and altered stress responsiveness of HPA indicating autonomic imbalance. The role of low-dose sarin/organophosphate exposure needs to be considered in the military and civilian populations that suffer from autonomic imbalance and/or cardiomyopathies of indeterminate origin.

Speed HE, Blaiss CA, Kim A, Haws ME, Melvin NR, Jennings M, Eisch AJ, Powell CM (2012) Delayed reduction of hippocampal synaptic transmission and spines following exposure to repeated subclinical doses of organophosphorus pesticide in adult mice. Toxicol Sci 125(1):196-208. (Epub 2011 Sep 26.)

Agricultural and household organophosphorus (OP) pesticides inhibit acetylcholinesterase (AchE), resulting in increased acetylcholine (Ach) in the central nervous system. In adults, acute and prolonged exposure to high doses of AchE inhibitors causes severe, clinically apparent symptoms, followed by lasting memory impairments and cognitive dysfunction.

The neurotoxicity of repeated environmental exposure to lower, subclinical doses of OP pesticides in adults is not as well studied. However, repeated exposure to acetylcholinesterase inhibitors, such as chlorpyrifos (CPF), pyridostigmine, and sarin nerve agent, has been epidemiologically linked to delayed onset symptoms in GWI and may be relevant to environmental exposure in farm workers among others. We treated adult mice with a subclinical dose (5 mg/kg) of CPF for 5 consecutive days and investigated hippocampal synaptic transmission and spine density early (2-7 days) and late (3 months) after CPF administration. No signs of cholinergic toxicity were observed at any time during or after treatment. At 2-7 days after the last injection, we found increased synaptic transmission in the CA3-CA1 region of the hippocampus of CPF-treated mice compared with controls. In contrast, at 3 months after CPF administration, we observed a 50 percent reduction in synaptic transmission likely due to a corresponding 50 percent decrease in CA1 pyramidal neuron synaptic spine density. This study is the first to identify a biphasic progression of synaptic abnormalities following repeated OP exposure and suggests that even in the absence of acute cholinergic toxicity, repeated exposure to CPF causes delayed persistent damage to the adult brain in vivo.

Squibb KS, Gaitens JM, Engelhardt S, Centeno JA, Xu H, Gray P, McDiarmid MA (2012) Surveillance for Long-Term Health Effects Associated With Depleted Uranium Exposure and Retained Embedded Fragments in US Veterans. J Occup Environ Med 54(6):724-32.

OBJECTIVE: To ensure that all Veterans with retained embedded fragments are properly monitored for potential health effects of embedded materials.

METHODS: Urine biomonitoring and health surveillance programs were developed to gather information about health risks associated with chemicals released from embedded fragments.

RESULTS: Elevated systemic exposure to depleted uranium (DU) that continues to occur in Veterans with DU fragments remains a concern, although no clinically significant DU-related health effects have been observed to date. Other metals and local tissue reactions to embedded fragments are also of concern.

CONCLUSIONS: Knowledge gained from these programs will help to develop guidelines for surgical removal of tissue-embedded fragments.

Steele L, Sastre A, Gerkovich MM, Cook MR (2012) Complex Factors in the Etiology of Gulf War Illness: Wartime Exposures and Risk Factors in Veteran Subgroups. Environ Health Perspect 120(1):112-118. (Epub 2011 Sep 7.)

BACKGROUND: At least one-fourth of U.S. Veterans who served in the 1990-1991 Gulf War are affected by the chronic symptomatic illness known as GWI. Clear determination of the causes of GWI has been hindered by many factors, including limitations in how epidemiologic studies have assessed the impact of the complex deployment environment on Veterans' health.

OBJECTIVE: We sought to address GWI etiologic questions by evaluating the association of symptomatic illness with characteristics of Veterans' deployment.

METHODS: We compared Veteran-reported wartime experiences in a population-based sample of 304 GW Veterans: 144 cases who met pre-established criteria for GWI and 160 controls. Veteran subgroups and confounding among deployment variables were considered in the analyses.

RESULTS: Deployment experiences and the prevalence of GWI differed significantly by Veterans' location in theater. Among personnel who were in Iraq or Kuwait, where all battles took place, GWI was most strongly associated with using pyridostigmine bromide pills [odds ratio (OR) = 3.5; 95 percent confidence interval (CI): 1.7, 7.4] and being within 1 mile of an exploding SCUD missile (OR = 3.1; 95 percent CI: 1.5, 6.1). For Veterans who remained in support areas, GWI was significantly associated only with personal pesticide use, with increased prevalence (OR = 12.7; 95 percent CI: 2.6, 61.5) in the relatively small subgroup that wore pesticide-treated uniforms, nearly all of whom also used skin pesticides. Combat service was not significantly associated with GWI.

CONCLUSIONS: Findings support a role for a limited number of wartime exposures in the etiology of GWI, which differed in importance with the deployment milieu in which Veterans served.

Terry AV Jr (2012) Functional consequences of repeated organophosphate exposure: potential non-cholinergic mechanisms. Pharmacol Ther 134(3):355-65. (Epub 2012 Mar 20.)

The class of chemicals known as the "organophosphates" (OPs) comprises many of the most common agricultural and commercial pesticides that are used worldwide as well as the highly toxic chemical warfare agents. The mechanism of the acute toxicity of OPs in both target and non-target organisms is primarily attributed to inhibitory actions on various forms of cholinesterase leading to excessive peripheral and central cholinergic activity. However, there is now substantial evidence that this canonical (cholinesterase-based) mechanism cannot alone account for the wide-variety of adverse consequences of OP exposure that have been described, especially those associated with repeated exposures to levels that produce no overt signs of acute toxicity. This type of exposure has been associated with prolonged impairments in attention, memory, and other domains of cognition, as well as chronic illnesses where these symptoms are manifested (e.g., Gulf War Illness, Alzheimer's disease). Due to their highly reactive nature, it is not surprising that OPs might alter the function of a number of enzymes and proteins (in addition to cholinesterase). However, the wide variety of long-term neuropsychiatric symptoms that have been associated with OPs suggests that some basic or fundamental neuronal process was adversely affected during the exposure period. The purpose of this review is to discuss several non-cholinesterase targets of OPs that might affect such fundamental processes and includes cytoskeletal and motor proteins involved in axonal transport, neurotrophins and their receptors, and mitochondria (especially their morphology and

movement in axons). Potential therapeutic implications of these OP interactions are also discussed.

Tillman GD, Calley CS, Green TA, Buhl VI, Biggs MM, Spence JS, Briggs RW, Haley RW, Hart J Jr, Kraut MA (2012) Event-related potential patterns associated with hyperarousal in Gulf War illness syndrome groups. Neurotoxicology 33(5):1096-1105.

An exaggerated response to emotional stimuli is one of the several symptoms widely reported by Veterans of the 1991 Persian Gulf War. Many have attributed these symptoms to post-war stress; others have attributed the symptoms to deployment-related exposures and associated damage to cholinergic, dopaminergic, and white matter systems. We collected event-related potential (ERP) data from 20 Veterans meeting Haley criteria for Gulf War Syndromes 1-3 and from 8 matched GW Veteran controls, who were deployed but not symptomatic, while they performed an auditory three-condition oddball task with gunshot and lion roar sounds as the distractor stimuli. Reports of hyperarousal from the ill Veterans were significantly greater than those from the control Veterans; different ERP profiles emerged to account for their hyperarousability. Syndromes 2 and 3, who have previously shown brainstem abnormalities, show significantly stronger auditory P1 amplitudes, purported to indicate compromised cholinergic inhibitory gating in the reticular activating system. Syndromes 1 and 2, who have previously shown basal ganglia dysfunction, show significantly weaker P3a response to distractor stimuli, purported to indicate dysfunction of the dopaminergic contribution to their ability to inhibit distraction by irrelevant stimuli. All three syndrome groups showed an attenuated P3b to target stimuli, which could be secondary to both cholinergic and dopaminergic contributions or disruption of white matter integrity.

Tillman GD, Calley CS, Green TA, Buhl VI, Biggs MM, Spence JS, Briggs RW, Haley RW, Kraut MA, Hart J Jr. (2013) Visual event-related potentials as markers of hyperarousal in Gulf War illness: Evidence against a stress-related etiology. Psychiatry Res 211(3):257-267. (Epub 2012 Nov 11.)

An exaggerated response to emotional stimuli is among the many symptoms widely reported by Veterans of the 1991 Persian Gulf War. These symptomologies have been attributed to damage and dysfunction associated with deployment-related exposures. We collected event-related potential data from 22 Veterans meeting Haley criteria for GW Syndromes 1-3 and from 8 matched GW Veteran controls, who were deployed but not symptomatic, while they performed a visual three-condition oddball task where images authenticated to be associated with the 1991 Persian Gulf War were the distractor stimuli. Hyperarousal reported by ill Veterans was significantly greater than that by control Veterans, but this was not paralleled by higher amplitude P3a in their ERP responses to GW-related distractor stimuli. Whereas previous studies of PTSD patients have shown higher amplitude P3b responses to target stimuli that are placed amid trauma-related nontarget stimuli, ill Veterans in this study showed P3b amplitudes to target stimuli-placed amid GW-related nontarget stimuli – that were significantly lower than those of the control group. Hyperarousal scores reliably predicted P3b, but not P3a, amplitudes. Although

many factors may contribute to P3b amplitude differences – most notably depression and poor sleep quality, symptoms that are prevalent in the GW syndrome groups – our findings in context of previous studies on this population are consistent with the contention that dysfunction in cholinergic and dopaminergic neurotransmitter systems, and in white matter and basal ganglia may be contributing to impairments in GW Veterans.

Todorov TI, Ejnik JW, Guandalini G, Xu H, Hoover D, Anderson L, Squibb K, McDiarmid MA, Centeno JA (2013) Uranium quantification in semen by inductively coupled plasma mass spectrometry. J Trace Elem Med Biol 27(1):2-6. (Epub 2012 Sep 1.)

In this study, we report uranium analysis for human semen samples. Uranium quantification was performed by inductively coupled plasma mass spectrometry. No additives, such as chymotrypsin or bovine serum albumin, were used for semen liquefaction, as they showed significant uranium content. For method validation we spiked 2g aliquots of pooled control semen at three different levels of uranium: low at 5 pg/g, medium at 50 pg/g, and high at 1000 pg/g. The detection limit was determined to be 0.8 pg/g uranium in human semen. The data reproduced within 1.4-7 percent RSD and spike recoveries were 97-100 percent. The uranium level of the unspiked, pooled control semen was 2.9 pg/g of semen (n=10). In addition six semen samples from a cohort of Veterans exposed to depleted uranium (DU) in the 1991 Gulf War were analyzed with no knowledge of their exposure history. U ranium levels in the Veterans' semen samples ranged from undetectable (<0.8 pg/g) to 3350 pg/g. This wide concentration range for uranium in semen is consistent with known differences in current DU body burdens in these individuals, some of whom have retained embedded DU fragments.

Tuite JJ, Haley RW (2012) Meteorological and Intelligence Evidence of Long-Distance Transit of Chemical Weapons Fallout from Bombing Early in the 1991 Persian Gulf War. Neuroepidemiology 40(3):160-177.

BACKGROUND: Coalition bombings on the night of January 18-19, 1991, early in the GW, targeted the Iraqi chemical weapons infrastructure. On January 19, 1991, nerve agent alarms sounded within coalition positions hundreds of kilometers to the south, and the trace presence of sarin vapor was identified by multiple technologies. Considering only surface dispersion of plumes from explosions, officials concluded that the absence of casualties around bombed sites precluded long-distance transit of debris to U.S. troop positions to explain the alarms and detections. Consequently, they were discounted as false positives, and low-level nerve agent exposure early in the air war was disregarded in epidemiologic investigations of chronic illnesses.

INTELLIGENCE DATA: Newly assembled evidence indicates that plumes from those nighttime bombings of Iraqi chemical facilities would have traversed the stable nocturnal boundary layer and penetrated the residual layer where they would be susceptible to rapid transit by supergeostrophic winds. This explanation is supported by plume height predictions, available weather charts, weather satellite images showing transit of a hot air

mass, effects of solar mixing of atmospheric layers, and observations of a stationary weather front and thermal inversion in the region.

CONCLUSIONS: Current evidence supports long-distance transit. Epidemiologic studies of chronic postwar illness should be reassessed using Veterans' reports of hearing nerve agent alarms as the measure of exposure.

Wallin MT, Culpepper WJ, Coffman P, Pulaski S, Maloni H, Mahan CM, Haselkorn JK, Kurtzke JF, Veterans Affairs Multiple Sclerosis Centres of Excellence Epidemiology Group (2012) The Gulf War era multiple sclerosis cohort: age and incidence rates by race, sex and service. Brain 135(Pt 6):1778-1785.

We characterize here a new nationwide incident cohort of multiple sclerosis from the U.S. military-Veteran population. This cohort provides an update to the only other U.S. nationwide incidence study of multiple sclerosis performed during the 1970s. Medical records and data from the DoD and VA for cases of multiple sclerosis who served in the military between 1990, the start of the GW era, and 2007 and who were service-connected for this disorder by the VA from 1990 forward were reviewed. A total of 2,691 patients were confirmed as having multiple sclerosis: 2,288 definite, 190 possible, 207 clinically isolated syndrome and six neuromyelitis optica. Overall, racial categories were White, Black and Other, which included all Hispanics. There were 1,278 White males and 556 females; 360 Black males and 296 females; and 200 others, 153 (77 percent) of whom were Hispanic. Mean age at onset of 30.7 years did not differ significantly by race or sex. Age at onset was 17-50 years in 99 percent, the same age range as 99 percent of the military. Average annual age specific (age 17-50 years) incidence rates per 100,000 for the entire series were 9.6 with 95 percent confidence interval of 9.3-10.0. Rates for Blacks were highest at 12.1 with confidence interval 11.2-13.1, Whites were 9.3 (interval 8.9-9.8) and others were 6.9 (interval 6.0-7.9). For 83 Hispanics defined for 2000-2007, the rate was 8.2 (interval 6.5-10.1). Much smaller numbers gave rates of 3.3 for Asian/Pacific Islanders and 3.1 for Native Americans. Rates by sex for Whites were 7.3 and 25.8 male and female, respectively, for Blacks 8.4 and 26.3, and for Hispanics 6.6 and 17.0. Rates by service were high for Air Force (10.9) and Army (10.6), medium for Navy (9.1) and Coast Guard (7.9), and low for Marines (5.3). Relative risk of multiple sclerosis was 3.39 female: male and 1.27 Black: White. These new findings indicate that females of all races now have incidence rates for multiple sclerosis some three times those of their male counterparts and that among these groups; Blacks have the highest and others (probably including Hispanics) the lowest incidence rates regardless of sex or service. The low rate for Marines is unexplained. This GW-era multiple sclerosis cohort provides a unique resource for further study.

Yoder M, Tuerk PW, Price M, Grubaugh AL, Strachan M, Myrick H, Acierno R (2012) Prolonged exposure therapy for combat-related posttraumatic stress disorder: Comparing outcomes for Veterans of different wars. Psychol Serv 9(1):16-25.

There is significant support for exposure therapy as an effective treatment for PTSD across a variety of populations, including Veterans; however, there is little empirical information regarding how Veterans of different war theaters respond to exposure therapy.

Accordingly, questions remain regarding therapy effectiveness for treatment of PTSD for Veterans of different eras. Such questions have important implications for the dissemination of evidence based treatments, treatment development, and policy. The current study compared treatment outcomes across 112 Veterans of the Vietnam War, the first Persian Gulf War, and the wars in Afghanistan and Iraq. All subjects were diagnosed with PTSD and enrolled in prolonged exposure (PE) treatment. Veterans from all three groups showed significant improvement in PTSD symptoms, with Veterans from Vietnam and Afghanistan/Iraq responding similarly to treatment. Persian Gulf Veterans did not respond to treatment at the same rate or to the same degree as Veterans from the other two eras. Questions and issues regarding the effectiveness of evidence based treatment for Veterans from different eras are discussed.

IV. RESEARCH FUNDING TRENDS

This section provides a quantitative overview of the current research portfolio on GWVI and the evolution of the portfolio since 1999. Topics that are covered include research expenditures by VA, DoD, and HHS from FY 2003-2012, and the number of research projects in which the Federal Government has invested.

The appropriated funds for FY 2003 through 2012, centrally obligated to each project, are shown in Appendix C and summarized in Table IV-1. Federal funding for GW research totaled approximately $223 million during this period. Funds obligated for these projects prior to FY 2003 are not shown in either Table IV-1 or Appendix C. Since many projects are multi-year efforts for which funds are obligated at the beginning of the project period, projects that received all of their funds prior to FY 2003 are listed with no associated obligation ($0) in Appendix C. Federal funds for these earlier projects were reported in prior annual reports to Congress.

Table IV-1. 10-Year (FY 2003-2012) Funding Trends for GW Research in Millions of Dollars

Department	FY '03	FY '04	FY '05	FY '06	FY '07	FY '08	FY '09	FY '10	FY '11	FY '12	Total Costs FY '03-'12
DoD	$ 16.4	$ 11.1	$ 10.1	$ 10.1	$ 3.4	$ 11.7	$ 10.4	$ 10.4	$ 10.3	$ 3.7	**$ 97.6**
HHS	$ 1.0	$ 0.5	$ 0.5	$ 0.4	$ 0.4	$ 0.4	$ 0	$ 0	$ 0	$ 0	**$ 3.2**
VA	$ 5.7	$ 7.6	$ 9.5	$ 13.0	$22.1	$21.9	$ 16.6	$ 13.9	$ 5.6	$ 6.7	**$ 122.6**
Total	**$ 23.1**	**$ 19.2**	**$20.1**	**$ 23.5**	**$ 25.9**	**$ 34.0**	**$ 27.0**	**$ 24.3**	**$ 15.9**	**$ 10.4**	**$ 223.4**

The funding level for FY 2011 in the table above differs from the value reported in the 2011 annual report to Congress due to the delayed start of eight projects funded through the FY 2011 appropriation for the Gulf War Illness Research (GWIRP) managed by the Congressionally Directed Medical Research Programs (CDMRP) at DoD. DoD funding for

FY 2012 is $3.7 million for the same reason and will be updated in the 2013 annual report to Congress after the projects have begun.

VA, DoD, and HHS sponsored a total of 412 distinct research projects on GWVI during the period of FY 1992 through FY 2012. Appendix A lists all of the research and development projects and programs supported now or in the past by each of the three Federal agencies. Nine projects have been dual-funded by VA and DoD, and each agency has given the project its own unique project number (DoD-115/VA-062; DoD-116/VA-063; DoD-116A/VA-063A; DoD-116B/VA-063B; D0D-118/VA-061; DoD-119/VA-055; DoD-125/VA-074; DoD-143/VA-078; and DoD-154/VA-088). In prior annual reports to Congress, the total number of funded projects was corrected for the number of dual-funded projects. Starting with the 2005 annual report to Congress, this practice has been discontinued since VA and DoD may start or end funding of their portion of these projects independent of each other. Each dual-funded project is, therefore, treated as two distinct projects.

The numbers of new, ongoing, and completed projects for FY 2003 - FY 2012 are shown in Figure IV-1. As of September 30, 2012, 358 projects (87 percent of the 412 projects) were completed, and 58 projects (13 percent) were new or ongoing; the numbers of new, ongoing, and completed projects for each fiscal year are shown in Figure IV-1.

The annual distribution of new and ongoing projects within the five major Research Focus Areas is shown in Figure IV-2. From FY 2003 through 2012, new and ongoing research assigned to the Brain and Nervous System Function, Environmental Toxicology, and General Health and Symptoms categories have represented 96.2 ± 1.0 percent of all new and ongoing projects.

Figure IV-1. Cumulative Number of Funded Projects (FY 2003 - FY 2012)

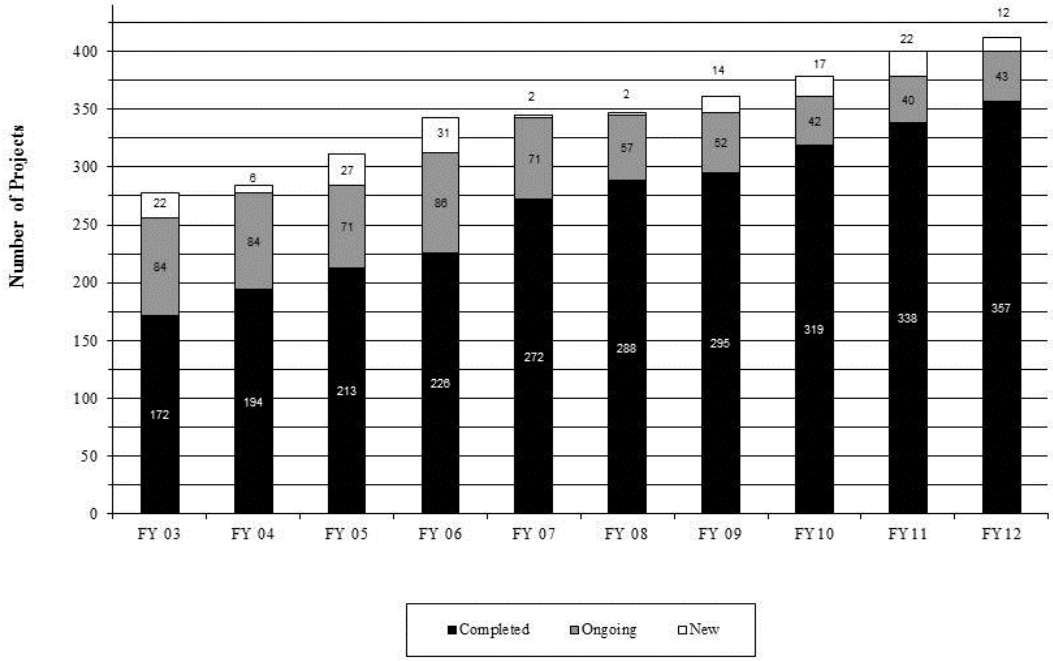
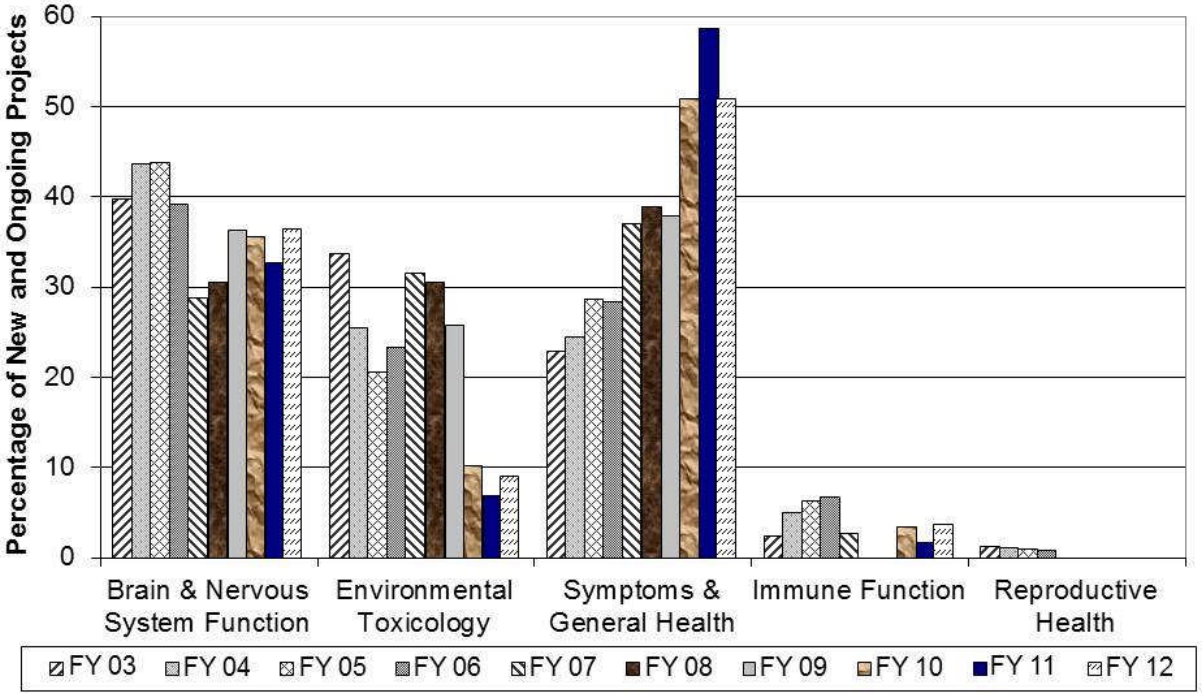


Figure IV-2. Annual Distribution of Topic Areas for New and Ongoing Projects



V. NEW RESEARCH PROJECTS AND INITIATIVES

A. New Initiatives

Requests for Applications (RFA) were issued by both CDMRP and VA in FY 2012. Proposals received for review in response to these RFAs were reviewed, and projects selected for funding will begin in FY 2013. As more investigators engage in GW research, there has been an increase in applications for funding and increases in the number of newly-approved treatment trials and biomarker studies. DoD has also accepted proposals for two GW research consortia that will concentrate research expertise on specific topics.

VA's Gulf War Research Strategic Plan was completed and submitted for approval. The Strategic Plan outlines the direction of research for the next 5 years with the focus on converting promising research results into clinical treatments. Considerable effort at VA is also focused on increasing the number of investigators involved in Gulf War research. A meeting of VA GW researchers was held in September 2012 to encourage collaborations and mentoring of young investigators. Representatives of DoD were also present to describe their GW research program.

VA has also initiated programs to facilitate researchers' access to Veterans who are willing to participate in research studies. In addition to the GW Era Cohort and Biorepository and the Million Veteran Program (described in the 2011 Report) which are designed to collect blood and health information, VA launched the GW Veterans' Illnesses Biorepository in 2012 which will collect post-mortem brain and spinal cord tissue for future research into neurological conditions affecting GW Veterans. Together these three databases will allow researchers to select a study group which enables them to target specific symptoms or conditions as they investigate diagnostic markers or develop treatments.

B. Portfolio Review

VA and DoD each review their portfolios of GW research on a regular basis in order to determine research gaps and to expand successful research topic areas. The Federal GW research portfolio is increasingly focused on identifying potential new treatments (clinical trials, including complementary medicine approaches) for ill GW Veterans and identifying new diagnostic markers of disease and potential therapeutic targets to develop new therapies. VA and DoD continue to share information regarding funded GW research projects and coordinate activities, whenever possible, to maximize combined program impact. To facilitate this process, the GW research programs will also be integrated into the ongoing Department-wide VA-DoD Joint Program Reviews.

C. New Projects

This section highlights the new research projects that have been approved since last year's 2011 annual report to Congress. Projects preceded by an asterisk (*) were either funded using funds appropriated in prior years or approved for funding in prior fiscal years but not identified in previous annual reports to Congress. They are described below and incorporated into the tables in Appendices A, B, and C.

These projects include new approaches to treating and diagnosing GW Veterans. In one treatment trial, insulin will be administered as a nasal spray to improve memory and attention, mood, and the overall health of GW Veterans. In another, acupressure will be used to deal with chronic pain and fatigue. To develop diagnostic tools for GWVI, an understanding of some of the fundamental physiological processes in ill GW Veterans is necessary. A magnetic resonance spectroscopy (MRS) study will non-invasively monitor important chemical reactions in the brains of GW Veterans, and in another study, magnetoencephalography (MEG) will be evaluated as a means of distinguishing GW Veterans with CMI from Veterans with other conditions. Other studies will investigate biological markers in serum, markers of immune system problems, and the connection of gastrointestinal problems to the nervous system. There will also be surveys of GW Veterans to determine their current health status and the value of clinical treatments they have received. Fundamental studies, using animal models, monitoring the effects of potentially toxic materials like those used in the Kuwait theater of operations (organophosphate pesticides or a combination of PB, insect repellents, and pesticides) will be undertaken as well. To be able to study neurological changes that have occurred in GW Veterans, a repository of post-mortem brain and spinal cord tissue is being initiated.

Tissue will be donated by GW Veterans, and these specimens will be used for research in the future.

DoD Projects

Eight projects were funded through the FY 2011 appropriation for the GWIRP managed by CDMRP but did not start until FY 2012. These projects focused on Brain and Nervous System Function (2), Immune Dysfunction (1), and Symptoms and General Health (5).

*DoD-213, "Effectiveness of Acupressure Treatment for Pain Management and Fatigue Relief in GW Veterans" will investigate acupressure as a treatment for fatigue and pain in ill GW Veterans and will investigate the relationship between objective measures of electroencephalography (EEG) recording, specifically, the corticomuscular coherence and power spectra in theta band, and subjective measures of well established clinical instruments.

*DoD-214, "Abnormalities in Human Brain Creatine Metabolism in Gulf War Illness Probed with MRS" will investigate creatine metabolism in brains of ill GW Veterans by estimating amounts of phosphocreatine (PCr) and free creatine (Cr) using 31P and 1H magnetic resonance spectroscopy (MRS). Secondary goals are to measure 1H T2 relaxation times of the methyl resonances of PCr and Cr and to measure amounts of adenosine triphosphate (ATP), inorganic phosphate (Pi), and magnesium ion (Mg2+) and to estimate intracellular pH from 31P MRS data.

*DoD-215, "Identifying Immune Drivers of Gulf War Illness Using a Novel Daily Sampling Approach" will seek to identify a set of immune factors that predict symptoms in ill GW Veterans. Using cross-correlations and linear mixed models, a small set of immune factors to drive day-to-day GW illness (GWI) symptom severity will be identified, considering both same day predictors and time-lagged effects.

*DoD-216, "Intranasal Insulin: A Novel Treatment for Gulf War Multisymptom Illness" is designed to evaluate the efficacy of two different doses (10 IU BID and 20 IU BID) of daily intranasal insulin for 8 weeks on memory and attention, overall physical health and mood, symptoms characteristic of or associated with CMI, safety, and neuroendocrine changes in GW Veterans. The main hypothesis is that intranasal insulin will improve these characteristics.

*DoD-217, "Efficacy of Treatments Tried: A Survey of GW Veterans" is designed to learn what the treatment experience has been for GW Veterans and to gain in-depth information on which treatments have been perceived to confer greatest benefit and which were perceived to produce greatest harm. For treatments with high variance in reported effect, the survey is designed to assess whether subject or treatment factors may predict in whom a treatment appears to yield benefit or harm.

*DoD-218, "Establishing a 1991 Veterans Research Network To Improve Characterization of GWI and Provide a National Resource for Veterans and Investigators" will attempt to

systematically characterize the current health status of 1991 GW Veterans in relation to nondeployed era Veterans, to use collected data to optimize a symptom-based case definition of GWI, and to develop an information and recruitment resource for 1991-era Veterans and for investigators conducting research in this population.

*DoD-219, “Organophosphate-Related Alterations in Myelin and Axonal Transport in the Living Mammalian Brain” is designed to determine if exposure to organophosphates (OP) results in alterations in myelin (as observed in symptomatic GW patients) and axonal transport (as observed ex vivo in animals) in the living rodent brain. The central hypothesis is that OPs compromise the integrity of myelin and impair axonal transport, effects that lead to functional impairment of neuronal pathways supporting cognition and other neurological processes. The research will study two OPs, a representative insecticide that was used in the first GW, chlorpyrifos, and a representative nerve agent, diisopropylfluorophosphate.

*DoD-220, “Biomarker Discovery in GW Veterans: Development of a War Illness Diagnostic Panel” is designed to develop a diagnostic tool for CMI in GW Veterans based on testing results from multiple serum analytes potentially associated with biological processes that contribute to GW Veterans’ symptoms.

VA Projects

VA initiated funding for four new projects during FY 2011. These four projects focused on Brain and Nervous System Function (3) and Symptoms and General Health (1).

VA-174, “GW Veterans’ Illnesses Biorepository (CSP#501B)” is a pilot study to establish a repository for brain and spinal cord tissue from GW Veterans regardless of whether they receive health care at VA. The tissue will enable VA to provide accurate diagnoses of neurodegenerative diseases and potentially develop better diagnostic procedures and treatments.

VA-175, “Memory and Mood Enhancing Therapies for Gulf War Illness” will use an animal model to determine if antidepressants and antioxidants can improve cognitive function and neurogenesis in the hippocampus after the rats have been exposed to PB, insect repellent (DEET), pesticide (permethrin), and physical stress. This hypothesis is based on the results of preliminary studies.

VA-176, “MEG Synchronous Neural Interactions (SNI) in GW Veterans” will use SNI, which assess functional interactions among neural populations derived from magnetoencephalographic signals, to distinguish between symptomatic and asymptomatic GW Veterans. Early results with PTSD patients showed that GW Veterans with PTSD exhibited SNI that were different from those seen in controls and patients with PTSD alone.

VA-177, “Somatic Hypersensitivity in Veterans with IBS” will extend the study of chronic gastrointestinal problems in deployed Veterans which are related to increased intestinal

permeability. If it can be shown that microRNAs modulate the increased permeability, then new treatments for these Veterans can be developed.

VI. REFERENCES

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Appendices

Federally Funded Research Projects

Appendix A

Project Index By Department

DEPARTMENT OF DEFENSE PROJECTS

DoD-001	Naval Health Study Program
DoD-001A	Epidemiologic Studies of Morbidity Among GW Veterans: A Search for Etiologic Agents and Risk Factors; A Study of Symptoms Among 1500 Seabees
DoD-001B	Epidemiologic Studies of Morbidity Among GW Veterans: A Search for Etiologic Agents and Risk Factors; Study 2: A Comparative Study of Hospitalizations among Active-Duty Personnel Who Participated in the Gulf War and Similar Personnel Who Did Not
DoD-001C	Epidemiologic Studies of Morbidity Among GW Veterans: A Search for Etiologic Agents and Risk Factors; Study 3: A comparative study of pregnancy outcomes among GW Veterans and other active-duty personnel
DoD-001D	Epidemiologic Studies of Morbidity Among GW Veterans: A Search for Etiologic Agents and Risk Factors; Study 4: Infertility and Miscarriage in GW Veterans
DoD-001E	Epidemiologic Studies of Morbidity Among GW Veterans: A Search for Etiologic Agents and Risk Factors; Study 5: Seabee Health Study
DoD-001F	Epidemiologic Studies of Morbidity Among GW Veterans: A Search for Etiologic Agents and Risk Factors; Study 6: A Comparison of Nonfederal Hospitalization Experience Among Veterans in California who have separated from active service: GWV vs. NDV
DoD-001G	Epidemiologic Studies of Morbidity Among GW Veterans: A Search for Etiologic Agents and Risk Factors; Study 7: Prevalence of Congenital Anomalies Among Children of Persian GW Veterans
DoD-002	Physiological and Neurobehavioral Effects in Rodents from Exposure to Pyridostigmine, Fuels, and DEET
DoD-004	The General Well-Being of Gulf War Era Service Personnel from the States of Pennsylvania and Hawaii: A Survey
DoD-007A	Health Risk Assessment of Embedded Depleted Uranium: Behavior, Physiology, Histology, and Biokinetic Modeling
DoD-007B	Carcinogenicity of Depleted Uranium Fragments
DoD-008A	Serologic Diagnosis of Viscerotropic Leishmaniasis (VTL)
DoD-008B	Development of a Leishmania Skin Test Antigen (LSTA)
DoD-009	Identification of the Genetic Factors Which Control Tropism in Leishmania
DoD-010	Pyridostigmine Synergistic Toxicity Study
DoD-011	Male/Female Differential Tolerances to Pyridostigmine Bromide
DoD-013	Effects of Persian Gulf War Service on Military Working Dogs
DoD-014	Risk Factors Among US Army Soldiers for Enrolling on the Department of Veterans Affairs Gulf War Registry
DoD-015	Comparative Mortality Among US Military Personnel Worldwide During Operations Desert Shield and Desert Storm

DoD-016	Kuwait Oil Fire Health Risk Assessment
DoD-017	Retrospective Studies Involving Military Use of Pyridostigmine as a Pretreatment for Nerve Agent Poisoning
DoD-018	Kuwait Oil Fires Troop Exposure Assessment Model (TEAM)
DoD-019	Persian Gulf Veterans Health Tracking System
DoD-021	Study of Variability in Pyridostigmine Inhibition of Blood Cholinesterases in Healthy Adults and Individuals with Symptoms Following Participation in Operation Desert Storm
DoD-022	Chronic Organophosphorus Exposure and Cognition
DoD-023	Acute and Long-Term Impact of Deployment to Southwest Asia on the Physical and Mental Health of Soldiers and their Families
DoD-030	Epidemiological Studies Persian Gulf War Illnesses, PG Women's Health Linkage Study
DoD-031	Dysregulation of the Stress Response in the Persian Gulf Syndrome
DoD-032	Neuropsychological Functioning in Persian Gulf Era Veterans
DoD-033	Effects of Pyridostigmine in Flinders Line Rats Differing in Cholinergic Sensitivity
DoD-034	Characterization of Emissions from Heaters Burning Leaded Diesel Fuel in Unvented Tents
DoD-035	Feasibility of Investigating Whether There is a Relationship Between Birth Defects and Service in the Gulf War
DoD-036	Fatigue in Persian Gulf Syndrome-Physiologic Mechanisms
DoD-037	Neurobehavioral and Immunological Toxicity of Pyridostigmine, Permethrin, and DEET in Male and Female Rats
DoD-038	Diagnostic Antigens of Leishmania tropica
DoD-039	A Controlled Epidemiological and Clinical Study into the Effect of Gulf War Service on Servicemen and Women of the United Kingdom Armed Forces
DoD-040	Psychological and Neurobiological Consequences of the Gulf War Experience
DoD-041	Evaluation of Muscle Function in Persian Gulf Veterans
DoD-042	The Symptomatic Persian Gulf Veterans Protocol: An Analysis of Risk Factors with an Immunologic and Neuropsychiatric Assessment
DoD-044	Investigation of Seminal Plasma Hypersensitivity Reactions
DoD-045	Air Force Women's Health Surveillance Study
DoD-046	Exploratory Data Analysis with the CCEP Database
DoD-047	Study of Mycoplasmal Infections in GW Veterans

DoD-048	Assessment of Genomic Instability via Chromosome 7 Inversion Frequency in a Gulf-War Syndrome Cohort vs. Selected Control Groups
DoD-049	Diagnosis and Dosimetry of Exposure to Sulfur Mustard: Development of Standard Operating Procedures and Exploratory Research on Protein Adducts
DoD-050	Toxicokinetics of 0-Ethyl S-(2-Diisopropylaminoethyl) Methylphosphonothioate [(+)-VX] in Rats, Hairless Guinea Pigs and Marmosets - Identification of Metabolic Pathways
DoD-051	Transgenic Engineering of Cholinesterases: Tools for Exploring Cholinergic Responses
DoD-052	Female Gender and Other Potential Predictors of Functional Health Status Among Persian GW Veterans
DoD-053	Long-Term Effects of Subclinical Exposures to Sarin
DoD-054	Assessment of Subchronic Neurobehavioral and Neuropathologic Effects in Rats Following Low-Level Sarin Exposure
DoD-055	Low-Level Exposure to GB Vapor in Air: Diagnosis/Dosimetry, Lowest Observable Effect Levels, Performance-Incapacitation, and Possible Delayed Effects
DoD-056	Low-Level Sarin Neurotoxicity and Its Modulation by Pyridostigmine
DoD-057	Physiologic Effects of Stress in GW Veterans
DoD-058	Illness Among Persian GW Veterans: Case Validation Studies
DoD-059	Pyridostigmine-induced Neurodegeneration: Role of neuronal Apoptosis
DoD-060	Butyrylcholinesterase Genetic Variants in Persons with Gulf War Illness
DoD-061	Neurophysiologic and Neuropathologic Effects in Monkeys of Low Level Exposures to Sarin, Pyridostigmine, Pesticides, and Botulinum Toxoid
DoD-062	Sarin and Pyridostigmine Interaction under Physical Stress: Neurotoxic Effects in Mice
DoD-063	PGW Veterans: Epidemiological and Clinical Evidence for Residual Organophosphate Neurotoxicity
DoD-064	Individual Differences in Neurobehavioral Effects of Pyridostigmine
DoD-065	Multi-disciplinary Pathophysiologic Studies of Neurotoxic Gulf War Related Syndromes Leading to Diagnosis and Treatment
DoD-066	Testing for mycoplasmal infection replicability of nucleoprotein gene tracking and forensic polymerase chain reaction
DoD-067	Antibacterial Treatment Method Based Upon the Excretion of Dead and Decaying Spherical Bacteria
DoD-069	Five-Year Follow-Up of Army Personnel Exposed to Chemical Warfare Agents
DoD-070	War Syndromes from 1900 to the Present: Symptom Patterns and Long-term Health Outcomes
DoD-071	A Comparison of Post Deployment Hospitalization Between Vietnam and GW Veterans

DoD-072	Long-term Effects of Subchronic Exposure to Sarin, Alone and with Stress or Other Chemicals
DoD-073	Post-deployment Morbid Stress, Behavior and Health: Developing a Model for Predicting Morbidity, Mortality, and other Adverse Outcomes
DoD-074	Relationship of Stress Exposures to Health in GW Veterans
DoD-075	Toxic Interactions of Prophylactic Drugs and Pesticides
DoD-076	Evaluations of Immunotoxicity due to Concurrent Exposure to DEET, Pyridostigmine, and JP-8 Jet Fuel
DoD-077	Percutaneous Absorption of Chemical Mixtures Relevant to the Gulf War
DoD-078	Experimental Models of Gulf War Syndrome
DoD-079	Time Course of Stress-induced Impairment of Blood Brain Barrier
DoD-080	Molecular Regulation of Corticosteroid Receptor Expression in Stress-Responsive Cells
DoD-081	Immunotoxicity due to Coexposure to DEET, Pyridostigmine, and Stress
DoD-082	Feasibility of Developing a Registry of PTSD Affected Veteran Sib Pairs
DoD-083	Risk for Stress-related Substance Abuse: the Effects of Family History of Alcoholism
DoD-084	Psychobiologic Alterations in Persian GW Veterans with and without PTSD
DoD-085	CNS Cytokines and CRH in GW Veterans with Multiple Unexplained Symptoms
DoD-086	Effects of Combat Stress on Structure and Function of the Hippocampus
DoD-087	Measurement and Validation of Psychosocial Risk and Resilience Factors Accounting for Physical and Mental Health and Health-Related Quality of Life among PGWVs
DoD-088	Clinical Relevance of Novel Immunological Markers in PTSD
DoD-089	Limbic Blood Flow and Opiate Receptor PET in Posttraumatic Stress Disorder
DoD-090	SPECT Benzodiazepine Receptor and MR Imaging in PTSD
DoD-091	Neurological and Circadian Substrates of PTSD-like Behaviors
DoD-092	Traumatic Experiences Persistently Enhance Cue-dependent Learning: Toward an Animal Model of Chronic Stress and Posttraumatic Stress Disorder
DoD-093	Troops Exposed to Nerve Agents at Aberdeen Proving Ground: Follow-Up
DoD-094	Combined Analysis of the VA and DoD Gulf War Clinical Registries: A Study of Clinical Findings from Systematic Medical Examinations of 100,000 U.S. GW Veterans
DoD-095	Development of Diagnostic tools and alternative treatment drugs for Leishmania
DoD-096	Deployment Health Center
DoD-097	Surveillance of B. pertussis among Military Trainees with Respiratory Disease: Development and

	Validation of a Highly Sensitive PCR and Beacon Probe based Method for Diagnosis of Pertussis
DoD-098	Investigation of a Baseline Medical Database to Evaluate the Health of Military Forces and Veterans
DoD-099	DoD-wide Medical Surveillance for Potential Long-Term Adverse Events associated with Anthrax Immunization in Active Duty Service Members, Proposal 1: Hospitalizations
DoD-100	Antibodies to Squalene
DoD-101	Mechanisms in Chronic Multisymptom Illnesses
DoD-102	Case-Control Study of Fatal Motor Vehicle Crashes Among Gulf War and Non-Deployed Veterans
DoD-103	Human Metabolism and Interactions of Deployment-related Chemicals
DoD-104	Clinical Evaluation of a Proposed New Gulf War Syndrome
DoD-105	Neuroplasticity and Calcium Signaling in Stressed Rat Amygdala
DoD-106	The Role of Th1/Th2 cytokine balance in Gulf War-related illness
DoD-107	Stress, Organophosphates and Blood Brain Barrier Integrity
DoD-108	Health Status of Current National Guard Members
DoD-109	Disordered Responses to Orthostatic Stress in the Pathogenesis of Gulf War Syndrome Symptoms
DoD-110	Predictors of Career and Family Dysfunction in Young Adults Enlisting in the United States Navy
DoD-111	Autonomic Dysfunction in GW Veterans
DoD-112	Role of Respirable Saudi Arabian Sand and Pyridostigmine in the Gulf War Syndrome: An Autoimmune Adjuvant Disease?
DoD-113	Interactions of Subsymptomatic Doses of Sarin with Pyridostigmine: Neurochemical, Behavioral, and Physiological Effects
DoD-114	A Re-examination of Neuropsychological Functioning in Persian GW Veterans
DoD-115	A Randomized, Multi-Center, Controlled Trial of Multi-Model Therapy in Veterans with Gulf War Illnesses (EBT) (See also VA-62; formerly VA/DoD 1D)
DoD-116	VA/DoD Core Funding of the Medical Follow-Up Agency (See also VA-63; formerly VA-DoD-2D/2V)
DoD-116A	Follow-Up Investigation of Troops Exposed to Nerve Agents at Aberdeen Proving Ground (Pilot Study) (See also VA-63A; formerly VA/DoD-2DA)
DoD-116B	Patterns of Pre-Persian Gulf War Illness and Health Care Seeking, Pilot Study (See also VA-63B; formerly VA/DoD- 2DB)
DoD-117	Patterns of Pre-Persian Gulf War Illness and Health Care Seeking
DoD-118	An Epidemiological Investigation into the Occurrence of Amyotrophic Lateral Sclerosis (ALS) Among GW Veterans (See also VA-61)

DoD-119	Antibiotic Treatment of GW Veterans' Illnesses (ABT) (See also VA-55)
DoD-120	Assessing the Potential Health Impact of the Gulf War on Saudi Arabia National Guard Members and Their Dependents
DoD-121	Evaluation of the Health Risks of Embedded Depleted Uranium Shrapnel During Pregnancy and Offspring Development
DoD-122	Carcinogenic Potential of Depleted Uranium and Tungsten Alloys
DoD-123	Immunotoxicity of Depleted Uranium and Heavy Metal Tungsten Alloys
DoD-124	Randomized, Controlled Trial for Combination Treatment with Pyridostigmine, DEET, and Permethrin
DoD-125	A Randomized Clinical Trial of Cognitive-Behavioral Treatment for PTSD in Women (See VA-74)
DoD-126	Blood-Brain Barrier Transport of Uranium
DoD-127	Depleted Uranium Fragment Carcinogenicity: Extrapolation of Findings in Rodents to Man
DoD-128	Multifactorial Assessment of Depleted Uranium Neurotoxicity
DoD-129	Inhalation of Uranium Oxide Aerosol: CNS Deposition, Neurotoxicity, and Role in Gulf War Illness
DoD-130	Carcinogenicity and Immunotoxicity of Embedded Depleted Uranium and Heavy-Metal Tungsten Alloys in Rodents
DoD-131	Magnetic Resonance and Spectroscopy of the Human Brain in Gulf War Illnesses
DoD-132	Impaired Auditory Sensory Gating, Acoustic Startle Response: Effects of Long and Short Deployments on Army Combat Readiness
DoD-133	Odors, Deployment Stress, and Health: A Conditioning Analysis of Gulf War Syndrome
DoD-134	Identification and Development of Biological Markers of Human Exposure to the Insecticide Permethrin
DoD-135	Biochemical Markers for Exposure to Low Doses of Organophosphorus Exposure
DoD-136	A Mechanism-Based, Molecular Fingerprint Strategy for Detecting Biomarkers of Organophosphate Exposure
DoD-137	Low Level Exposure to Sulfur Mustard: Development of a SOP for Analysis of Albumin Adducts and of a System for Non-Invasive Diagnosis on Skin
DoD-138	Improving Blood Monitoring of Enzymes as Biomarkers of Risk from Anticholinergic Pesticides and Chemical Warfare Agents
DoD-139	Assessment of the Role of Stress-Activated Kinase in the Pathogenesis of Gulf War Illnesses
DoD-140	US DOD Surveillance for Neoplasms in Infancy
DoD-141	Physical, Mental, Social, and Family Health Outcomes of GW Veterans
DoD-142	Illnesses Among Persian GW Veterans: Case Validation Studies (Iowa / Great Britain)

DoD-143	Millennium Cohort Study (See also VA-78)
DoD-144	Psychological Health Screening: Methods and Metrics for Deployed Forces
DoD-145	Early Intervention Research Program to Enhance Soldier Resilience
DoD-146	Assessment of Toxicology Assays Methods & Chemical Exposures Among a Cohort of US Marines
DoD-147	Development and Validation of the Automated Neuropsychological Assessment Metric (ANAM) for Deployment Health Monitoring Applications
DoD-148	Predicting operational readiness for deployed Army National Guard and Army Reserve soldiers and families
DoD-149	Longitudinal Health Study of GW Veterans
DoD-150	Validation Study of Gulf War Deployment Files
DoD-151	Mechanisms and Consequences of Vaccine Effects on Th1/Th2 Balance in GW Veterans
DoD-152	Characterization of Intracellular Signaling Pathways Activated by Nerve Agents
DoD-153	Gulf War Illness Research
DoD-154	Prospective Assessment of Neurocognition in Future Gulf-deployed and Gulf-nondeployed Military Personnel: A Pilot Study (See also VA-88)
DoD-155	Neuropsychological Functioning in GW Veterans Exposed to Pesticides and Pyridostigmine Bromide
DoD-156	The Effects of Diesel Exhaust and Stress on the Acute Phase Response and Symptoms in the Chemically Intolerant
DoD-157	Novel Leishmania and Malaria Potassium Channels: Candidate Therapeutic Targets
DoD-158	Preconceptional Paternal Exposure to Embedded Depleted Uranium Fragments: Transmission of Genetic Damage to Offspring
DoD-159	Neurotoxicity from Chronic Exposure to Depleted Uranium
DoD-160	Characterization of the Reproductive Toxicity of Depleted Uranium
DoD-161	Glutamate Receptor Aptamers and ALS
DoD-162	Evaluation of the Effects of Multiple Immunizations Administered in a Stressful Environment on Immunologic Function
DoD-163	Neuroimmune Effects of Inhaling Low Dose Sarin
DoD-164	Efficacy of Adjunct Sleep Interventions for PTSD (EASI-PTSD)
DoD-165	Biomarkers for Amyotrophic Lateral Sclerosis in Active Duty Military – BALSAM
DoD-166	A Placebo-Controlled Trial of Prazosin vs. Paroxetine in Combat Stress-Induced PTSD Nightmares and Sleep Disturbance

DoD-167	Mass Spectrometry to Identify New Biomarkers of Nerve Agent Exposure
DoD-168	Developing Biomarkers for Fibromyalgia
DoD-169	Development of Novel Therapy for Chronic Neuropathic Pain
DoD-170	Structural MRI and Cognitive Correlates in Pest-Control Personnel from Gulf War I
DoD-171	Q10 for GW Veterans
DoD-172	CNDP1 Polymorphisms and Carnosine Therapy in GWI
DoD-173	A Randomized, Double-Blind, Placebo-Controlled, Crossover Trial of Mifepristone in GW Veterans with Chronic Multisymptom Illness
DoD-174	Autonomic Biomarkers and Treatment for Gulf War Illness
DoD-175	Novel Pharmacological Approaches for Treatment of Neurotoxicity Induced by Chronic Exposure to Depleted Uranium
DoD-176	Studies on Axonal Transport in an Animal Model for Gulf War Syndrome
DoD-177	Randomized Trial of an Environmental Medicine Approach to GW Veterans' Illness
DoD-178	Analysis of Paraoxonase Status among US Navy GW Veterans with Increased Postwar Symptoms, Psychological Morbidity and Medical Conditions
DoD-179	Mechanisms of Mitochondrial Defects in Gulf War Syndrome
DoD-180	Exercise-Induced Cerebrospinal Fluid Proteomic Biomarkers of Fatigue
DoD-181	Effectiveness of Acupuncture in the Treatment of Gulf War Illness
DoD-182	Trial of Naltrexone and Dextromethorphan for GW Veterans' Illness
DoD-183	Biomarkers of GW Veterans' Illnesses: Tissue Factor, Chronic Coagulopathy, and Inflammation
DoD-184	Treatment of Memory Impairment and Sensorimotor Deficits in an Animal Model for the GW Veterans' Illnesses
DoD-185	Neuroinflammatory Pathobiology in Gulf War Illness: Characterization with an Animal Model
DoD-186	Small Intestinal Microbial Community in Gulf War Illness
DoD-187	The Use of Comprehensive Molecular Profiling with Network and Control Theory to Better Understand GWI and Model Therapeutic Strategies
DoD-188	Epithelial Cell TRPV1-Mediated Airway Sensitivity as a Mechanism for Respiratory Symptoms Associated with Gulf War Illness
DoD-189	Discovery of AMPA Receptor Potentiating Aptamers as Cognitive Enhancers
DoD-190	Identification of Biological Pathways Implicated in Hippocampal Dysfunction and Cognitive Impairment in Gulf War Illness

DoD-191	Neuroimmune Interactions, Low-Dose Sarin Inhalation, and Gulf War Syndrome
DoD-192	Exhaled Gas Frequency Comb Spectroscopy Distinguishing Biomarkers in Gulf War Illness Syndrome
DoD-193	Genome Instability: A Common Link in Gulf War Illness Patients
DoD-194	Homeostatic and Circadian Abnormalities in Sleep and Arousal in Gulf War Syndrome
DoD-195	Theory-Driven Models for Correcting "Fight or Flight" Imbalance in Gulf War Illness
DoD-196	Probiotic (Bifidobacterium Infantis) for Gulf War Illness
DoD-197	Undiagnosed Small Fiber Polyneuropathy: Is It a Component of Gulf War Illness?
DoD-198	Oxidative Stress
DoD-199	Gulf War Illness: Evaluation of an Innovative Detoxification Program
DoD-200	XMRV and GWI: Is There an Association?
DoD-201	Synergistic Actions of Pyridostigmine Bromide and Insecticides on Muscle and Vascular Nociceptors
DoD-202	Brain-Immune Interactions as Basis of Gulf War Illness: Consortium Development
DoD-203	Redefining Gulf War Illness Using Longitudinal Health Data: The Devens Cohort
DoD-204	Nasal Irrigation for Chronic Rhinosinusitis and Fatigue in Patients with Gulf War Syndrome
DoD-205	The HPA Axis and Metabolic Outcomes in GW Veterans
DoD-206	Investigating Clinical Benefits of a Novel Sleep-Focused, Mind-Body Program on Gulf War Illness Symptoms: An Exploratory Randomized Controlled Trial
DoD-207	Gulf War Illness Research Development Consortium (GWIC)
DoD-208	Genome-Wide Association Study of a Validated Case Definition of Gulf War Illness in a Population-Representative Sample
DoD-209	Proteomic Immune Profiling for the Therapeutic Modulation of Cognitive Impairment in a Novel GWI Mouse Model
DoD-210	Assessment of Diverse Biological Indicators in Gulf War Illness: Are They Replicable? Are They Related?
DoD-211	Detection of Xenotropic Murine Leukemia Virus-Related Virus (XMRV) in Gulf War Illness: Role in Pathogenesis or Biomarker?
DoD-212	Integrative Physiology of Gulf War Illness: Role of Autonomic Function, Central Neural Processing, and Sleep
DoD-213	Effectiveness of Acupressure Treatment for Pain Management and Fatigue Relief in GW Veterans
DoD-214	Abnormalities in Human Brain Creatine Metabolism in Gulf War Illness Probed with MRS
DoD-215	Identifying Immune Drivers of Gulf War Illness Using a Novel Daily Sampling Approach

DoD-216	Intranasal Insulin: A Novel Treatment for Gulf War Multisymptom Illness
DoD-217	Efficacy of Treatments Tried: A Survey of GW Veterans
DoD-218	Establishing a 1991 Veterans Research Network to ImproveCharacterization of Gulf War Illness and Provide a National Resource for Veterans and Investigators
DoD-219	Organophosphate-Related Alterations in Myelin and Axonal Transport in the Living Mammalian Brain
DoD-220	Biomarker Discovery in GW Veterans: Development of a War Illness Diagnostic Panel

DEPARTMENT OF HEALTH AND HUMAN SERVICES PROJECTS

HHS-001	Health Assessment of Persian GW Veterans from Iowa
HHS-002	Disease Cluster in a Pennsylvania Air National Guard Unit, EPI-AID 95-18
HHS-003	Biomarkers of Susceptibility and Polycyclic Aromatic Hydrocarbon (PAH) Exposure in Urine and Blood Cell DNA from U.S. Army Soldiers Exposed to Kuwaiti Oil Well Fires
HHS-004	Suspected Increase of Birth Defects and Health Problems Among Children Born to Persian GW Veterans in Mississippi
HHS-005	Cognitive Function and Symptom Patterns in Persian Gulf Veterans
HHS-006	Defining Gulf War Illness
HHS-007	Immunotoxicity of Dermal Permethrin and Cis-Urocanic Acid
HHS-008	Strategy to Identify Non-Additive Response to Chemical Mixtures
HHS-009	Improving Health Risk Communications to Prevent Unexplained Illnesses Related to Military Deployments
HHS-010	Health-e Voice: Optimized Implementation of a Stepped Clinical Risk Communications Guideline
HHS-011	Deployment to the Gulf War and the Subsequent Development of Cancer
HHS-012	Genetic Epidemiology of ALS in Veterans

DEPARTMENT OF VETERANS AFFAIRS PROJECTS

VA-001	Mortality Follow-up Study of Persian Gulf Veterans
VA-002	National Health Survey of Persian Gulf Veterans
VA-002A	VA National Survey of Persian Gulf Veterans - Phase I
VA-002B	VA National Survey of Persian Gulf Veterans - Phase II
VA-002C	VA National Survey of Persian Gulf Veterans - Phase III
VA-003	Use of Roster of Veterans Who Served in Persian Gulf Area
VA-004	Boston Environmental Hazards Research Center Program
VA-004A	Evaluation of Cognitive Functioning of Persian Gulf Veterans
VA-004B	Evaluation of Neurological Functioning in Persian Gulf Veterans
VA-004C	Gulf War and Vietnam Veterans Cancer Incidence Surveillance
VA-004D	Evaluation of Respiratory Dysfunction Among GW Veterans
VA-004E	The Aromatic Hydrocarbon Receptor (AhR) as a Biomarker of Susceptibility
VA-004F	Validity of Computerized Tests
VA-005	East Orange Environmental Hazards Research Center Program
VA-005A	Health and Exposure Survey of Persian Gulf Veterans
VA-005B	Physiological and Psychological Assessments of Persian Gulf Veterans
VA-005C	Effects of Exertion and Chemical Stress on Persian Gulf Veterans
VA-005D	Effects of Genetics and Stress on Responses to Environmental Toxins
VA-006	Core Program: Portland Environmental Hazards Research Center: Environment, Veterans Health and the Gulf War Syndrome. Core Project for Clinical and Epidemiology Research
VA-006A	Psychosocial, Neuropsychological and Neurobehavioral Assessment (Project I)
VA-006B	Clinical and Neuroendocrine Aspects of Fibromyalgia (Project II)
VA-006C	Neurotoxicity of Environmental Pollutants and Warfare Agents (Project III)
VA-006D	DNA Damage from Chemical Agents and Its Repair (Project IV)
VA-006E	Clinical and Epidemiology Leishmania Research
VA-007	Desert Storm Reunion Survey
VA-008	Psychological Test Data of GW Veterans Over Time

VA-009	Evaluation of Cognitive Functioning in Persian GW Veterans Reporting War-related Health Problems
VA-010	Memory and Attention in PTSD
VA-011	Neuropsychological Functioning in Veterans
VA-012	Psychological Assessment of Operation Desert Storm Returnees
VA-013	Neurobehavioral Aspects of Persian Gulf Experiences: A Pilot Study
VA-015	Vaccine-Mediated Immunity Against Leishmaniasis
VA-016	Protective Immunity in Experimental Visceral Leishmaniasis
VA-017	Immunological Evaluation of Persian Gulf Veterans
VA-018	Chronic Gastrointestinal Illness in Persian Gulf Veterans
VA-020	Psychological Adjustment in Operation Desert Shield/Storm Veterans
VA-021	A Comparison of PTSD Symptomatology among Three Army Medical Units Involved in ODS
VA-036	Stress Symptoms and Their Causal Attribution in Desert Storm Veterans
VA-040	Musculoskeletal Symptoms in Gulf War Syndrome
VA-046	Diarrhea in Persian Gulf Veterans: An Irritable Bowel-Like Disorder
VA-047	Retrospective Verification of Mustard Gas Exposure
VA-048	Cross-Sensitization as a CNS Model for Gulf War Chemical Intolerance
VA-049	Sensitivity to Pyridostigmine Bromide: Persistent Neural Dysfunction
VA-050	Neuropsychological findings in a sample of Operation Desert Storm Veterans
VA-051	Psychobiological Assessment of Desert Storm Veterans
VA-053	Spouses and Children Program
VA-054	Follow-up of Psychological and Neurocognitive Gulf War Outcome: Relation to Stress
VA-055	Antibiotic Treatment of GW Veterans' Illnesses (ABT) (See also DoD-119)
VA-056	Birmingham's GW Veterans' Illness Demonstration Clinic (13)
VA-057	Case Management and Residential Rehabilitation for Persian GW Veterans (13)
VA-058	Implementation and Evaluation of GW Veterans' Demonstration Project (13)
VA-059	Demonstration Treatment Program for GW Veterans with Unexplained Physical Symptoms (13)
VA-060	Identification and Management of Sleep Disorders in GW Veterans

VA-061	An Epidemiological Investigation into the Occurrence of Amyotrophic Lateral Sclerosis (ALS) Among GW Veterans (See also DoD-118)
VA-062	A Randomized, Multi-Center, Controlled Trial of Multi-Model Therapy in Veterans with Gulf War Illness (EBT) (See also DoD-115; formerly VA/DoD 1V)
VA-063	VA/DoD Core Funding of the Medical Follow-Up Agency (See also DoD-116; formerly VA/DoD-2V/2D)
VA-063A	Follow-Up Investigation of Troops Exposed to Nerve Agents at Aberdeen Proving Ground (Pilot Study) (See also DoD-116A; formerly VA/DoD-2VA/2DA)
VA-063B	Patterns of Pre-Persian Gulf War Illness and Health Care Seeking Pilot Study (See also DoD-116B; previously VA/DoD-2VB)
VA-064	Boston Environmental Hazards Research Center
VA-064A	Functional Neuroimaging in Lead Exposed Adults
VA-064B	Quantification and Validation of Structure-Function Relationships Through Visuospatial Test Performance
VA-064C	Development of a Structured Neurotoxicant Assessment Checklist (SNAC) for Clinical use in Veteran Populations
VA-065	San Antonio Environmental Hazards Research Center
VA-065A	Does a Variant of the Human SOD2 Gene Increase Sensitivity to Hazards?
VA-065B	The Contribution of FEN-1 to Genetic Integrity Subsequent to Oxidative Stress
VA-065C	The Importance of Hydrogen Peroxide Detoxification in Cellular Protection
VA-065D	Do Defective Gpx1 and ALDH2 Genes Increase Sensitivity to Environmental Hazards?
VA-066	Physiological Responding in Posttraumatic Stress Disorder
VA-067	Olfactory Functioning in GW Veterans
VA-068	Family Study of Fibromyalgia
VA-069	Cardiovascular Hyporeactivity and Fatiguing Illness in GW Veterans
VA-070	A Clinical Evaluation of the Health Status of Persian GW Veterans in VISN 8
VA-071	Central Nervous System Modulation of Visceral Pain in the Persian Gulf Syndrome
VA-072	Roles of Paraoxonase, Butyrylcholinesterase and Stress in Unexplained Illnesses
VA-073	Pain Sensitivity in GW Veterans with Medically Unexplained Musculoskeletal Pain
VA-074	A Randomized Clinical Trial for Cognitive-Behavioral Treatment for PTSD in Women (See DoD-125)
VA-075	ALS and Veterans: Are Veterans at Increased Risk?
VA-076	Analysis of Hippocampal Volume in Aging Combat Veterans with PTSD

VA-077	HPA Axis Reactivity in Men and Women with Chronic PTSD
VA-078	Millennium Cohort Study (See also DoD-143)
VA-080	Neurochemical and Neurobehavioral Impact of Pyridostigmine Bromide Treatment and Stress
VA-081	Stress, Pro-Inflammatory Cytokines and Coping Behavior
VA-082	Pituitary Adrenal Function in People with Fatiguing Illness
VA-083	Neuropsychological Assessment of a Population-Based Sample of Persian GW Veterans and Controls
VA-084	Neurobiology of Severe Psychological Trauma in Women
VA-085	Associative Learning in Veterans with and without Combat Experience
VA-086	A Clinical Trial of Magnetic Stimulation in Depression
VA-087	Improving Outcomes of Depression in Primary Care
VA-088	Prospective Assessment of Neurocognition in Future Gulf-deployed and Gulf-nondeployed Military Personnel: A Pilot Study (See also DoD-154)
VA-089	National Registry of Veterans with Amyotrophic Lateral Sclerosis
VA-090	Differential Gene Expression in Pathologies Associated with Neuronal Hyperexcitability: Links to Gulf War Illness
VA-090A	Neuronal Hyperexcitability and Motor Neuron Regeneration
VA-090B	Gene Expression and Proteomic Strategies in Severe Psychiatric Disorders
VA-090C	Developmental Differences in Alcohol Withdrawal Sensitivity
VA-090D	Seizures and Neuroplasticity: Physiology and Biochemistry
VA-091	The Role of Dietary Choline in Neuroprotection
VA-092	Acetylcholinesterase Activity in GW Veterans
VA-093	HPA Axis Alterations in PTSD: A Comparison of Gulf War and Vietnam Veterans
VA-094	The Immunology of Chronic Cutaneous Leishmaniasis
VA-095	The Role of Signal Regulatory Proteins in Astrocytomas
VA-096	Functional Imaging of Pain in Veterans with Unexplained Muscle Pain
VA-097	Improving a mM-CSF Tumor Vaccine for Established Intracranial Gliomas
VA-098	Post-Transcriptional Gene Regulation of VEGF in Malignant Gliomas
VA-099	Vaccination Against Visceral Leishmaniasis with a Multi-Epitope Vaccine
VA-100	Studies of the Blood-Brain Barrier and it's Manipulation

VA-101	Biomarkers Discovery in ALS
VA-102	Cholinergic and Monoaminergic Influences on Sleep
VA-103	Hypothalamic and Basal Forebrain Regulation of Sleep and Arousal
VA-104	Characterization of Pain Processing Mechanisms in the Irritable Bowel Syndrome
VA-105	Expression of the Major Surface Protease of Leishmania Chagasi
VA-106	Interoceptive Stressor Conditioning: A Model for Gulf War Illness
VA-107	Evaluation of Stress Response Systems in GW Veterans with CMI
VA-108	Telemedicine Treatment for Veterans with Gulf War Illness
VA-109	Effects of Stress on Memory: Brain Circuits, Mechanisms and Therapeutics
VA-110	Pain Among GW Veterans: Secondary Analysis of CSP#458 Data
VA-111	T-Cell Responses to Multiple Immunizations and Stress
VA-112	National VA Amyotrophic Lateral Sclerosis Research Consortium
VA-113	Novel Cause of Motor Neuron Disease
VA-114	Strategies in Therapeutic Development of Neurodegenerative Diseases
VA-115	Autonomic System Changes Cause Intestinal Symptoms in GW Veterans
VA-116	Quantitative Trait Genes Controlling Circadian and Sleep Behaviors
VA-117	Estimates of Cancer Prevalence in Gulf Veterans Using State Registries
VA-118	Post War Mortality from Neurologic Diseases in Gulf Veterans, 1991-2004
VA-119	Patterns of Microarray Gene Expression in Gulf War Illness
VA-120	Arginase NO Synthase and Cell Death in Amyotrophic Lateral Sclerosis
VA-121	Genes, Environment, and Oxidative Stress in Neurodegenerative Disorders
VA-122	Role of Mitochondrial Oxidative Stress in ALS
VA-123	Interactions Between Maternal Care, Stress and Pyridostigmine Bromide
VA-124	Early Life Determinants of Vulnerability to Pyridostigmine Bromide
VA-125	Effects of Gulf War Illness on Brain Structure, Function and Metabolism: MRI/MRS at 4 Tesla
VA-126	Structural Magnetic Resonance Imaging in Gulf War-Era Veterans
VA-127	Interactions of the Leishmania sp. with Mammalian Cells
VA-128	MR Tracking of Stem Cells for Replacement Therapy in ALS

VA-129	Glucocorticoid Responsivity in GW Veterans
VA-130	Tissue Factor and Gulf War-Associated Chronic Coagulopathies
VA-131	Neuroendocrine Regulators and Proteomics in GW Veterans with CMI
VA-132	Immunologic Mechanisms and Biomarkers in Gulf War Illness
VA-133	Longitudinal Study of Gene Expression and Gene Products in Veterans with Gulf War Illness
VA-134	Autonomic Functions of GW Veterans with Unexplained Illnesses
VA-135	Motor Neuron Function of GW Veterans with Excessive Fatigue
VA-136	Central Mechanisms Modulating Visceral Sensitivity
VA-137	Diarrhea-Predominant Irritable Bowel Syndrome in Persian Gulf Veterans
VA-138	Inspiratory Flow Dynamics During Sleep in GWS and the Effect of CPAP
VA-139	Sleep Neurobiology and Circuitry
VA-140	Integrated Neuroimaging and Neuropathological Analysis of the Effects of Physical Activity on Progression and Therapy in ALS
VA-141	Genetic Analysis of an Invertebrate Model of Amyotrophic Lateral Sclerosis
VA-142	VA Gulf War Biorepository Trust
VA-143	The Role of Protein Oxidation in the Progression of ALS
VA-144	Testing the Role of Permethrin on the Progression of ALS
VA-145	Proteomic Analysis of Cellular Response to Biological Warfare Agents
VA-146	Direct Delivery of Neurotoxins to the Brain by an Intranasal Route
VA-147	The Diagnosis and Pathogenesis of Occult Leishmaniasis
VA-148	Profile of GW Veterans Who Applied for Undiagnosed Illness Compensation
VA-149	Behavior of Neural Stem Cells in a Rat Model of GWS
VA-150	GW Veterans Illnesses' Research IDIQ Contract with UTSW
VA-151	Genetic Epidemiology of ALS
VA-152	Multiple Sclerosis in GW Veterans
VA-153	Bacterial Overgrowth Associated with Chronic Multi-Symptom Illness Complex
VA-154	Imaging Pain Modulation in GW Veterans with Chronic Muscle Pain
VA-155	Host Defense Mechanisms in Polyaromatic Hydrocarbon Carcinogenesis

VA-156	Gulf War Era Cohort and Biorepository (CSP 585)
VA-157	A Clinical Demonstration of an EEG Brain-Computer Interface for ALS Patients (CSP 567)
VA-158	Testing the Feasibility of MC CBT for Veterans with IBS
VA-159	Somatic hypersensitivity in Veterans with IBS
VA-160	Lipoic Acid Therapy for Experimental Autoimmune Encephalomyelitis
VA-161	Multiple Antigenic Peptides to Alter the Course of Autoimmune Disease
VA-162	Transcription factors regulating sensory gene expression and pain pathways
VA-163	Immunoregulation of Myelin Specific T Lymphocytes
VA-164	Central Mechanisms Modulating Visceral Sensitivity (renewal of VA-136)
VA-165	A Pilot Study of CPAP Adherence Promotion by Peer Buddies with Sleep Apnea
VA-166	A Randomized Controlled Trial of a Mindfulness-Based Intervention for Gulf War Syndrome
VA-167	Neuroprotection and Myelin Repair Mechanisms in Multiple Sclerosis
VA-168	Sleep Neurobiology and Circuitry
VA-169	Prevention of Hippocampal Neurodegeneration Due to Age and Apnea
VA-170	Epigenetic Mechanisms Relevant to the Pathogenesis of ALS
VA-171	Nanoparticle Coupled Antioxidants for Respiratory Illness in Veterans
VA-172	Understanding Pain of Gastrointestinal Origin in Women that Serve in OEF/OIF
VA-173	Impact of Exercise Training on Pain and Brain Function in GW Veterans
VA-174	VA GW Veterans' Illnesses Biorepository
VA-175	Memory and Mood Enhancing Therapiesfor Gulf War Illness
VA-176	MEG Synchronous Neural Interactions (SNI) in GW Veterans
VA-177	Somatic Hypersensitivity in Veterans with IBS

Appendix B

Project List by Research Focus Areas

Brain and Nervous System Function

Clinical

Research Focus	Project Focus	Project	Project Title
	Diagnosis	DoD-165	Biomarkers for Amyotrophic Lateral Sclerosis in Active Duty Military - BALSAM
	Symptoms	VA-142	VA Gulf War Biorepository Trust
	Treatment	VA-157	A Clinical Demonstration of an EEG Brain-Computer Interface for ALS Patients (CSP 567)
	Treatment; Symptoms;	DoD-166	A Placebo-Controlled Trial of Prazosin vs. Paroxetine in Combat Stress-Induced PTSD Nightmares and Sleep Disturbance
Environmental Toxicology	Symptoms; Exposure;	VA-064 A	Functional Neuroimaging in Lead Exposed Adults
Environmental Toxicology;	Symptoms Chemical Weapons	DoD-063	PGW Veterans: Epidemiological and Clinical Evidence for Residual Organophosphate Neurotoxicity
Immune Function; Symptoms and General Health	Symptoms	VA-005 B	Physiological and Psychological Assessments of Persian Gulf Veterans
Symptoms and General Health	Diagnosis	DoD-032	Neuropsychological Functioning in Persian Gulf Era Veterans
Symptoms and General Health	Symptoms	DoD-040	Psychological and Neurobiological Consequences of the Gulf War Experience
Symptoms and General Health	Prevention	DoD-083	Risk for Stress-related Substance Abuse: the Effects of Family History of Alcoholism
Symptoms and General Health	Symptoms	DoD-084	Psychobiologic Alterations in Persian GW Veterans with and without PTSD
Symptoms and General Health	Symptoms	DoD-086	Effects of Combat Stress on Structure and Function of the Hippocampus
Symptoms and General Health	Symptoms	DoD-089	Limbic Blood Flow and Opiate Receptor PET in Posttraumatic Stress Disorder
Symptoms and General Health	Diagnosis	DoD-090	SPECT Benzodiazepine Receptor and MR Imaging in PTSD
Symptoms and General Health	Symptoms	DoD-132	Impaired Auditory Sensory Gating, Acoustic Startle Response: Effects of Long and Short Deployments on Army Combat Readiness
Symptoms and General Health	Diagnosis	DoD-147	Development and Validation of the Automated Neuropsychological Assessment Metric (ANAM) for Deployment Health Monitoring Applications
Symptoms and General Health	Treatment	DoD-212	Integrative Physiology of Gulf War Illness: Role of Autonomic Functi on, Central Neural Processing, and Sleep
Symptoms and General Health	Symptoms	HHS-005	Cognitive Function and Symptom Patterns in Persian Gulf Veterans
Symptoms and General Health	Symptoms	VA-004	Boston Environmental Hazards Research Center Program
Symptoms and General Health	Symptoms	VA-004 A	Evaluation of Cognitive Functioning of Persian Gulf Veterans
Symptoms and General Health	Symptoms	VA-004 B	Evaluation of Neurological Functioning in Persian Gulf Veterans

Brain and Nervous System Function

Clinical

Research Focus	Project Focus	Project	Project Title
Symptoms and General Health	Diagnosis	VA-004 F	Validity of Computerized Tests
Symptoms and General Health	Symptoms	VA-005	East Orange Environmental Hazards Research Center Program
Symptoms and General Health	Symptoms	VA-006 A	Psychosocial, Neuropsychological and Neurobehavioral Assessment (Project I)
Symptoms and General Health	Symptoms	VA-007	Desert Storm Reunion Survey
Symptoms and General Health	Symptoms	VA-009	Evaluation of Cognitive Functioning in Persian Gulf War Veterans Reporting War-related Health Problems
Symptoms and General Health	Symptoms	VA-010	Memory and Attention in PTSD
Symptoms and General Health	Symptoms	VA-011	Neuropsychological Functioning in Veterans
Symptoms and General Health	Symptoms	VA-012	Psychological Assessment of Operation Desert Storm Returnees
Symptoms and General Health	Symptoms	VA-013	Neurobehavioral Aspects of Persian Gulf Experiences: A Pilot Study
Symptoms and General Health	Symptoms	VA-020	Psychological Adjustment in Operation Desert Shield/Storm Veterans
Symptoms and General Health	Symptoms	VA-021	A Comparison of PTSD Symptomatology among Three Army Medical Units Involved in ODS
Symptoms and General Health	Symptoms	VA-050	Neuropsychological findings in a sample of Operation Desert Storm Veterans
Symptoms and General Health	Symptoms	VA-051	Psychobiological Assessment of Desert Storm Veterans
Symptoms and General Health	Symptoms	VA-054	Follow-up of Psychological and Neurocognitive Gulf War Outcome: Relation to Stress
Symptoms and General Health	Symptoms	VA-064	Boston Environmental Hazards Research Center
Symptoms and General Health	Symptoms	VA-066	Physiological Responding in Posttraumatic Stress Disorder
Symptoms and General Health	Symptoms	VA-072	Roles of Paraoxonase, Butyrylcholinesterase and Stress in Unexplained Illnesses
Symptoms and General Health	Symptoms	VA-076	Analysis of Hippocampal Volume in Aging Combat Veterans with PTSD
Symptoms and General Health	Symptoms	VA-077	HPA Axis Reactivity in Men and Women with Chronic PTSD
Symptoms and General Health	Symptoms	VA-083	Neuropsychological Assessment of a Population-Based Sample of Persian GW Veterans and Controls
Symptoms and General Health	Symptoms	VA-084	Neurobiology of Severe Psychological Trauma in Women
Symptoms and General Health	Symptoms	VA-085	Associative Learning in Veterans with and without Combat Experience
Symptoms and General Health	Treatment	VA-089	National Registry of Veterans with Amyotrophic Lateral Sclerosis

Brain and Nervous System Function

Clinical

Research Focus	Project Focus	Project	Project Title
Symptoms and General Health	Symptoms	VA-093	HPA Axis Alterations in PTSD: A Comparison of Gulf War and Vietnam Veterans
Symptoms and General Health	Treatment	VA-112	National VA Amyotrophic Lateral Sclerosis Research Consortium
Symptoms and General Health	Diagnosis	VA-125	Effects of Gulf War Illness on Brain Structure, Function and Metabolism: MRI/MRS at 4 Tesla
Symptoms and General Health	Symptoms; Diagnosis;	DoD-065	Multi-disciplinary Pathophysiologic Studies of Neurotoxic Gulf War Related Syndromes Leading to Diagnosis and Treatment
Symptoms and General Health	Symptoms; Exposure;	DoD-057	Physiologic Effects of Stress in GW Veterans
Symptoms and General Health	Symptoms; Exposure;	DoD-133	Odors, Deployment Stress, and Health: A Conditioning Analysis of Gulf War Syndrome
Symptoms and General Health	Diagnosis; Symptoms;	DoD-087	Measurement and Validation of Psychosocial Risk and Resilience Factors Accounting for Physical and Mental Health and Health-Related Quality of Life among PGWVs
Symptoms and General Health	Treatment; Symptoms;	DoD-125	A Randomized Clinical Trial of Cognitive-Behavioral Treatment for PTSD in Women (See VA-74)
Symptoms and General Health	Diagnosis; Symptoms;	DoD-131	Magnetic Resonance and Spectroscopy of the Human Brain in Gulf War Illnesses
Symptoms and General Health	Diagnosis; Symptoms;	DoD-144	Psychological Health Screening: Methods and Metrics for Deployed Forces
Symptoms and General Health	Diagnosis; Symptoms;	DoD-153	Gulf War Illness Research
Symptoms and General Health	Treatment; Symptoms;	DoD-164	Efficacy of Adjunct Sleep Interventions for PTSD (EASI- PTSD)
Symptoms and General Health	Treatment; Symptoms;	VA-060	Identification and Management of Sleep Disorders in Gulf War Veterans
Symptoms and General Health	Diagnosis; Symptoms;	VA-064 B	Quantification and Validation of Structure-Function relationships through visuospatial test performance
Symptoms and General Health	Diagnosis; Symptoms;	VA-067	Olfactory Functioning in GW Veterans
Symptoms and General Health	Treatment; Symptoms;	VA-074	A Randomized Clinical Trial for Cognitive-Behavioral Treatment for PTSD in Women (See DoD-125)
Symptoms and General Health	Treatment; Symptoms;	VA-086	A Clinical Trial of Magnetic Stimulation in Depression
Symptoms and General Health	Treatment; Symptoms;	VA-087	Improving Outcomes of Depression in Primary Care
Symptoms and General Health	Treatment; Symptoms;	VA-138	Inspiratory Flow Dynamics During Sleep in GWS and the Effect of CPAP
Symptoms and General Health; Environmental Toxicology	Symptoms;	VA-008	Psychological Test Data of GW Veterans Over Time

Symptoms and General Health;	Symptoms; Diagnosis;	DoD-197	Undiagnosed Small Fiber Polyneuropathy: Is It a Component of Gulf War Illness?

Brain and Nervous System Function

Development

Research Focus	Project Focus	Project	Project Title
	Diagnosis	HHS-013	ALS Biomarkers in the Cerebrospinal Fluid
	Treatment	DoD-189	Discovery of AMPA Receptor Potentiating Aptamers as Cognitive Enhancers
	Treatment	VA-160	Lipoic Acid Therapy for Experimental Autoimmune Encephalomyelitis
Environmental Toxicology	Treatment; Exposure; Symptoms	DoD-184	Treatment of Memory Impairment and Sensorimotor Deficits in an Animal Model for the GW Veterans' Illnesses
Symptoms and General Health	Diagnosis	VA-113	Novel Cause of Motor Neuron Disease
Symptoms and General Health	Treatment; Prevention;	VA-097	Improving a mM-CSF Tumor Vaccine for Established Intracranial Gliomas
Symptoms and General Health	Diagnosis; Symptoms;	VA-101	Biomarkers Discovery in ALS
Symptoms and General Health	Treatment; Symptoms;	VA-128	MR Tracking of Stem Cells for Replacement Therapy in ALS

Epidemiology

Research Focus	Project Focus	Project	Project Title
Symptoms and General Health	Symptoms	DoD-023	Acute and Long-Term Impact of Deployment to Southwest Asia on the Physical and Mental Health of Soldiers and their Families
Symptoms and General Health	Symptoms	DoD-082	Feasibility of Developing a Registry of PTSD Affected Veteran Sib Pairs
Symptoms and General Health	Symptoms	DoD-114	A Re-examination of Neuropsychological Functioning in Persian GW Veterans
Symptoms and General Health	Symptoms	DoD-118	An Epidemiological Investigation into the Occurrence of Amyotrophic Lateral Sclerosis (ALS) Among GW Veterans (See also VA-61)
Symptoms and General Health	Symptoms	HHS-006	Defining Gulf War Illness
Symptoms and General Health	Diagnosis	HHS-012	Genetic Epidemiology of ALS in Veterans
Symptoms and General Health	Symptoms	VA-036	Stress Symptoms and Their Causal Attribution in Desert Storm Veterans
Symptoms and General Health	Symptoms	VA-061	An Epidemiological Investigation into the Occurrence of Amyotrophic Lateral Sclerosis (ALS) Among GW Veterans (See also DoD-118)
Symptoms and General Health	Symptoms	VA-068	Family Study of Fibromyalgia
Symptoms and General Health	Symptoms	VA-075	ALS and Veterans: Are Veterans at Increased Risk?

Brain and Nervous System Function

Epidemiology

Research Focus	Project Focus	Project	Project Title
Symptoms and General Health	Symptoms	VA-110	Pain Among GW Veterans: Secondary Analysis of CSP#458 Data
Symptoms and General Health	Symptoms	VA-150	GW Veterans Illnesses' Research IDIQ Contract
Symptoms and General Health	Diagnosis	VA-151	Genetic Epidemiology of ALS Veterans
Symptoms and General Health	Symptoms	VA-152	Multiple Sclerosis in GW Veterans
Symptoms and General Health	Symptoms; Diagnosis;	DoD-104	Clinical Evaluation of a Proposed New Gulf War Syndrome
Symptoms and General Health	Treatment; Prevention;	DoD-145	Early Intervention Research Program to Enhance Soldier Resilience
Symptoms and General Health	Diagnosis; Symptoms;	DoD-052	Female Gender and Other Potential Predictors of Functional Health Status Among Persian GW Veterans
Symptoms and General Health	Diagnosis; Symptoms;	DoD-154	Prospective Assessment of Neurocognition in Future Gulf-deployed and Gulf-nondeployed Military Personnel: A Pilot Study (See also VA-088)
Symptoms and General Health	Diagnosis; Symptoms;	HHS-002	Disease Cluster in a Pennsylvania Air National Guard Unit, EPI-AID 95-18
Symptoms and General Health	Diagnosis; Symptoms;	VA-088	Prospective Assessment of Neurocognition in Future Gulf-deployed and Gulf-nondeployed Military Personnel: A Pilot Study (See also DoD-154)

Mechanistic

Research Focus	Project Focus	Project	Project Title
	Diagnosis	VA-174	VA GW Veterans' Illnesses Biorepository
	Diagnosis	VA-176	MEG Synchronous Neural Interactions (SNI) in GW Veterans
	Symptoms	VA-091	The Role of Dietary Choline in Neuroprotection
	Symptoms	VA-120	Arginase NO Synthase and Cell Death in Amyotrophic Lateral Sclerosis
	Symptoms	VA-139	Sleep Neurobiology and Circuitry
	Symptoms	VA-141	Genetic Analysis of an Invertebrate Model of Amyotrophic Lateral Sclerosis
	Treatment	DoD-161	Glutamate Receptor Aptamers and ALS
	Treatment	VA-140	Integrated Neuroimaging and Neuropathological Analysis of the Effects of Physical Activity on Progression and Therapy in ALS
	Treatment	VA-163	Immunoregulation of Myelin Specific T Lymphocytes
	Treatment; Symptoms;	VA-161	Multiple Antigenic Peptides to Alter the Course of Autoimmune Disease

Brain and Nervous System Function

Mechanistic

Research Focus	Project Focus	Project	Project Title
Environmental Toxicology	Exposure; Interactions; Treatment	VA-175	Memory and Mood Enhancing Therapies for Gulf War Illness
Environmental Toxicology	Symptoms	VA-126	Structural Magnetic Resonance Imaging in Gulf War-Era Veterans
Environmental Toxicology	Symptoms; Exposure;	DoD-176	Studies on Axonal Transport in an Animal Model for Gulf War Syndrome
Environmental Toxicology	Exposure; Symptoms;	DoD-190	Identification of Biological Pathways Implicated in Hippocampal Dysfunction and Cognitive Impairment in Gulf War Illness
Environmental Toxicology Chemical Weapons	Exposure; Symptoms	DoD-219	Organophosphate-Related Alterations in Myelin and Axonal Transport in the Living Mammalian Brain
Environmental Toxicology;	Treatment; Exposure; Immune Function	DoD-185	Neuroinflammatory Pathobiology in Gulf War Illness: Characterization with an Animal Model
Environmental Toxicology; Symptoms and General Health	Symptoms; Exposure;	DoD-170	Structural MRI and Cognitive Correlates in Pest-Control Personnel from Gulf War I
Environmental Toxicology; Symptoms and General Health	Symptoms; Exposure;	DoD-198	Oxidative Stress
Symptoms and General Health	Symptoms	DoD-080	Molecular Regulation of Corticosteroid Receptor Expression in Stress-Responsive Cells
Symptoms and General Health	Symptoms	DoD-091	Neurological and Circadian Substrates of PTSD-like Behaviors
Symptoms and General Health	Symptoms	DoD-092	Traumatic Experiences Persistently Enhance Cue-dependent Learning: Toward an Animal Model of Chronic Stress and Posttraumatic Stress Disorder
Symptoms and General Health	Symptoms	DoD-105	Neuroplasticity and Calcium Signaling in Stressed Rat Amygdala
Symptoms and General Health	Treatment; Diagnosis	DoD-205	The HPA Axis and Metabolic Outcomes in GW Veterans
Symptoms and General Health	Symptoms	VA-081	Stress, Pro-Inflammatory Cytokines and Coping Behavior
Symptoms and General Health	Symptoms	VA-090	Differential Gene Expression in Pathologies Associated with Neuronal Hyperexcitability: Links to Gulf War Illness
Symptoms and General Health	Symptoms	VA-090A	Neuronal Hyperexcitability and Motor Neuron Regeneration
Symptoms and General Health	Symptoms	VA-090B	Gene Expression and Proteomic Strategies in Severe Psychiatric Disorders
Symptoms and General Health	Symptoms	VA-090C	Developmental Differences in Alcohol Withdrawal Sensitivity
Symptoms and General Health	Symptoms	VA-090D	Seizures and Neuroplasticity: Physiology and Biochemistry
Symptoms and General Health	Symptoms	VA-092	Acetylcholinesterase Activity in GW Veterans
Symptoms and General Health	Symptoms	VA-095	The Role of Signal Regulatory Proteins in Astrocytomas
Symptoms and General Health	Symptoms	VA-098	Post-Transcriptional Gene Regulation of VEGF in Malignant Gliomas
Symptoms and General Health	Symptoms	VA-103	Hypothalamic and Basal Forebrain Regulation of Sleep and Arousal
Symptoms and General Health	Symptoms	VA-109	Effects of Stress on Memory: Brain Circuits, Mechanisms and Therapeutics
Symptoms and General Health	Treatment	VA-114	Strategies in Therapeutic Development of Neurodegenerative Diseases

Brain and Nervous System Function

Mechanistic

Research Focus	Project Focus	Project	Project Title
Symptoms and General Health	Symptoms	VA-116	Quantitative Trait Genes Controlling Circadian and Sleep Behaviors
Symptoms and General Health	Symptoms	VA-121	Genes, Environment, and Oxidative Stress in Neurodegenerative Disorders
Symptoms and General Health	Symptoms	VA-122	Role of Mitochondrial Oxidative Stress in ALS
Symptoms and General Health	Symptoms	VA-129	Glucocorticoid Responsivity in GW Veterans
Symptoms and General Health	Diagnosis; Symptoms	DoD-214	Abnormalities in Human Brain Creatine Metabolism in Gulf War Illness Probed with MRS
Symptoms and General Health	Treatment; Symptoms;	VA-100	Studies of the Blood-Brain Barrier and its Manipulation
Symptoms and General Health	Prevention; Symptoms;	VA-102	Cholinergic and Monoaminergic Influences on Sleep
Symptoms and General Health	Treatment	VA-167	Neuroprotection and Myelin Repair Mechanisms in Multiple Sclerosis
Symptoms and General Health	Treatment	VA-168	Sleep Neurobiology and Circuitry
Symptoms and General Health	Treatment; Prevention	VA-169	Prevention of Hippocampal Neurodegeneration Due to Age and Apnea
Symptoms and General Health	Diagnosis; Prevention	VA-170	Epigenetic Mechanisms Relevant to the Pathogenesis of ALS
Immune Function	Treatment	DoD-202	Brain-Immune Interactions as Basis of Gulf War Illness: Consortium Development

Environmental Toxicology

Clinical

Research Focus	Project Focus	Project	Project Title
Brain and Nervous System Function	Interactions; Exposure; Symptoms	VA-048	Cross-Sensitization as a CNS Model for Gulf War Chemical Intolerance
Brain and Nervous System Function; Symptoms and General Health	Exposure; Symptoms;	VA-005 C	Effects of Exertion and Chemical Stress on Persian Gulf Veterans
Chemical Weapons	Symptoms	DoD-060	Butyrylcholinesterase Genetic Variants in Persons with Gulf War Illness
Chemical Weapons	Exposure	DoD-146	Assessment of Toxicology Assay Methods and Chemical Exposures Among a Cohort of US Marines Deployed in the Gulf War
Pyridostigmine Bromide	Exposure; Prevention;	DoD-011	Male/Female Differential Tolerances to Pyridostigmine Bromide
Pyridostigmine Bromide; Brain and Nervous System Function	Exposure; Interactions; Symptoms	DoD-124	Randomized, Controlled Trial for Combination Treatment with Pyridostigmine, DEET, and Permethrin
Pyridostigmine Bromide; Brain and Nervous System Function	Exposure; Interactions;	DoD-155	Neuropsychological Functioning in GW Veterans Exposed to Pesticides and Pyridostigmine Bromide Symptoms
Pyridostigmine Bromide; Brain and Nervous System Function	Exposure; Symptoms;	DoD-064	Individual Differences in Neurobehavioral Effects of Pyridostigmine

Environmental Toxicology

Clinical

Research Focus	Project Focus	Project	Project Title
Symptoms and General Health	Exposure; Symptoms;	VA-004 D	Evaluation of Respiratory Dysfunction Among GW Veterans
Symptoms and General Health; Brain and Nervous System Function	Exposure; Symptoms;	DoD-156	The Effects of Diesel Exhaust and Stress on the Acute Phase Response and Symptoms in the Chemically Intolerant

Development

Research Focus	Project Focus	Project	Project Title
	Interactions; Exposure;	DoD-034	Characterization of Emissions from Heaters Burning Leaded Diesel Fuel in Unvented Tents
	Diagnosis; Exposure;	DoD-134	Identification and Development of Biological Markers of Human Exposure to the Insecticide Permethrin
	Exposure; Interactions;	HHS-008	Strategy to Identify Non-Additive Response to Chemical Mixtures
Brain and Nervous System Function; Symptoms and General Health	Diagnosis; Exposure; Symptoms	VA-064 C	Development of a structured neurotoxicant assessment checklist (SNAC) for clinical use in veteran populations
Chemical Weapons	Diagnosis	DoD-049	Diagnosis and Dosimetry of Exposure to Sulfur Mustard: Development of Standard Operating Procedures and Exploratory Research on Protein Adducts
Chemical Weapons	Exposure; Diagnosis;	DoD-138	Improving Blood Monitoring of Enzymes as Biomarkers of Risk from Anticholinergic Pesticides and Chemical Warfare Agents
Chemical Weapons	Diagnosis; Exposure;	DoD-050	Toxicokinetics of 0-Ethyl S-(2-Diisopropylaminoethyl) Methylphosphonothioate [(+)-VX] in Rats, Hairless Guinea Pigs and Marmosets - Identification of Metabolic Pathways
Chemical Weapons	Diagnosis; Exposure;	DoD-137	Low Level Exposure to Sulfur Mustard: Development of an SOP for Analysis of Albumin Adducts and of a System for Non-Invasive Diagnosis on Skin
Chemical Weapons	Diagnosis; Exposure;	DoD-167	Mass Spectrometry to Identify New Biomarkers of Nerve Agent Exposure
Symptoms and General Health	Diagnosis; Exposure;	DoD-018	Kuwait Oil Fires Troop Exposure Assessment Model (TEAM)
Symptoms and General Health	Diagnosis; Exposure;	DoD-019	Persian Gulf Veterans Health Tracking System
Symptoms and General Health	Diagnosis; Exposure;	DoD-100	Antibodies to Squalene
Symptoms and General Health	Diagnosis; Exposure; Symptoms	DoD-016	Kuwait Oil Fire Health Risk Assessment

Environmental Toxicology

Epidemiology

Research Focus	Project Focus	Project	Project Title
Chemical Weapons	Exposure; Symptoms;	DoD-116 A	Follow-Up Investigation of Troops Exposed to Nerve Agents at Aberdeen Proving Ground (Pilot Study) (See also VA-63A; formerly VA/DoD-2DA)
Chemical Weapons	Exposure; Symptoms;	VA-063 A	Follow-Up Investigation of troops exposed to nerve agents at Aberdeen Proving Ground (Pilot Study) (See also DoD-116A; formerly VA/DoD-2VA/2DA)
Chemical Weapons; Symptoms and General Health	Exposure; Symptoms;	DoD-069	Five Year Follow-Up of Army Personnel Exposed to Chemical Warfare Agents
Chemical Weapons; Symptoms and General Health	Exposure; Symptoms;	DoD-093	Troops Exposed to Nerve Agents at Aberdeen Proving Ground: Follow-Up
Pyridostigmine Bromide	Exposure	DoD-017	Retrospective Studies Involving Military Use of Pyridostigmine as a Pretreatment for Nerve Agent
Pyridostigmine Bromide	Prevention; Exposure;	DoD-021	Study of Variability in Pyridostigmine Inhibition of Blood Cholinesterases in Healthy Adults and Individuals with Symptoms Following Participation in Operation Desert Storm
Symptoms and General Health	Symptoms	DoD-013	Effects of Persian Gulf War Service on Military Working Dogs
Symptoms and General Health	Exposure; Symptoms;	DoD-094	Combined Analysis of the VA and DoD Gulf War Clinical Registries: A Study of Clinical Findings from Systematic Medical Examinations of 100,000 U.S. GW Veterans
Symptoms and General Health	Exposure; Symptoms;	DoD-099	DoD-wide Medical Surveillance for Potential Long-Term Adverse Events associated with Anthrax Immunization in Active Duty Service Members, Proposal 1: Hospitalizations
Symptoms and General Health	Exposure; Symptoms;	VA-003	Use of Roster of Veterans Who Served in Persian Gulf Area
Symptoms and General Health	Exposure; Symptoms;	VA-006	Core Program: Portland Environmental Hazards Research Center: Environment, Veterans Health and the Gulf War Syndrome. Core Project for Clinical and Epidemiology Research

Mechanistic

Research Focus	Project Focus	Project	Project Title
	Exposure; Interactions;	DoD-103	Human Metabolism and Interactions of Deployment-related Chemicals
	Exposure; Interactions;	VA-145	Proteomic Analysis of Cellular Response to Biological Warfare Agents
	Exposure; Prevention;	HHS-003	Biomarkers of Susceptibility and Polycyclic Aromatic Hydrocarbon (PAH) Exposure in Urine and blood Cell DNA from U.S. Army Soldiers Exposed to Kuwaiti Oil Well Fires
	Exposure; Prevention;	VA-004 E	The Aromatic Hydrocarbon Receptor (AhR) as a Biomarker of Susceptibility

	Exposure; Prevention:	VA-171	Nanoparticle Coupled Antioxidants for Respiratory Illness in Veterans
Brain and Nervous System Function	Exposure	DoD-175	Novel Pharmacological Approaches for Treatment of Neurotoxicity Induced by Chronic Exposure to Depleted Uranium
Brain and Nervous System Function	Interactions; Exposure; Symptoms	DoD-178	Analysis of Paraoxonase Status among US Navy GW Veterans with Increased Postwar Symptoms, Psychological Morbidity and Medical Conditions
Brain and Nervous System Function	Exposure; Interactions;	VA-146	Direct Delivery of Neurotoxins to the Brain by an Intranasal Route
Brain and Nervous System Function	Exposure; Prevention;	DoD-159	Neurotoxicity from Chronic Exposure to Depleted Uranium
Brain and Nervous System Function	Exposure; Symptoms;	VA-144	Testing the Role of Permethrin on the Progression of ALS
Brain and Nervous System Function	Exposure; Symptoms;	VA-149	Behavior of Neural Stem Cells in a Rat Model of GWS
Brain and Nervous System Function; Chemical Weapons	Exposure; Symptoms;	DoD-022	Chronic Organophosphorus Exposure and Cognition
Brain and Nervous System Function; Immune Function	Exposure; Interactions; Symptoms	DoD-037	Neurobehavioral and Immunological Toxicity of Pyridostigmine, Permethrin, and DEET in Male and Female Rats
Brain and Nervous System Function;	Exposure	DoD-126	Blood-Brain Barrier Transport of Uranium
Brain and Nervous System Function;	Exposure; Symptoms	DoD-128	Multifactorial Assessment of Depleted Uranium Neurotoxicity
Brain and Nervous System Function;	Exposure; Symptoms	DoD-129	Inhalation of Uranium Oxide Aerosol: CNS Deposition, Neurotoxicity, and Role in Gulf War Illness
Brain and Nervous System Function; Pyridostigmine Bromide	Exposure; Interactions;	DoD-201	Synergistic Actions of Pyridostigmine Bromide and Insecticides on Muscle and Vascular Nociceptors
Brain and Nervous System Function; Pyridostigmine Bromide	Exposure; Symptoms;	VA-143	The Role of Protein Oxidation in the Progression of ALS
Brain and Nervous System Function; Symptoms and General Health	Exposure; Symptoms;	DoD-007 A	Health Risk Assessment of Embedded Depleted Uranium: Behavior, Physiology, Histology, and Biokinetic Modeling
Chemical Weapons	Exposure; Diagnosis;	DoD-136	A Mechanism-Based, Molecular Fingerprint Strategy for Detecting Biomarkers of Organophosphate Exposure
Chemical Weapons; Brain and Nervous System Function	Exposure	VA-006 D	DNA Damage from Chemical Agents and Its Repair (Project IV)
Chemical Weapons; Brain and Nervous System Function	Exposure; Diagnosis;	DoD-135	Biochemical Markers for Exposure to Low Doses of Organophosphorus Exposure
Chemical Weapons; Brain and Nervous System Function	Prevention; Exposure;	DoD-051	Transgenic Engineering of Cholinesterases: Tools for Exploring Cholinergic Responses
Chemical Weapons; Brain and Nervous System Function	Exposure; Interactions; Symptoms	DoD-054	Assessment of Subchronic Neurobehavioral and Neuropathologic Effects in Rats Following Low-Level Sarin Exposure
Chemical Weapons; Brain and Nervous System Function	Exposure; Interactions; Symptoms	DoD-055	Low-Level Exposure to GB Vapor in Air: Diagnosis/Dosimetry, Lowest Observable Effect Levels, Performance-Incapacitation, and Possible Delayed Effects
Chemical Weapons; Brain and Nervous System Function	Exposure; Interactions; Symptoms	DoD-056	Low-Level Sarin Neurotoxicity and Its Modulation by Pyridostigmine

Environmental Toxicology

Mechanistic

Research Focus	Project Focus	Project	Project Title
Chemical Weapons; Brain and Nervous System Function	Exposure; Interactions; Symptoms	DoD-061	Neurophysiologic and Neuropathologic Effects in Monkeys of Low Level Exposures to Sarin, Pyridostigmine, Pesticides, and Botulinum Toxoid
Chemical Weapons; Brain and Nervous System Function	Exposure; Interactions; Symptoms	DoD-062	Sarin and Pyridostigmine Interaction under Physical Stress: Neurotoxic Effects in Mice
Chemical Weapons; Brain and Nervous System Function	Exposure; Interactions; Symptoms	DoD-072	Long-term Effects of Subchronic Exposure to Sarin, Alone and with Stress or Other Chemicals
Chemical Weapons; Brain and Nervous System Function	Exposure; Interactions; Symptoms	DoD-113	Interactions of Subsymptomatic Doses of Sarin with Pyridostigmine: Neurochemical, Behavioral, and Physiological Effects
Chemical Weapons; Brain and Nervous System Function	Exposure; Symptoms;	DoD-053	Long-Term Effects of Subclinical Exposures to Sarin
Chemical Weapons; Brain and Nervous System Function	Exposure; Symptoms;	DoD-152	Characterization of Intracellular Signaling Pathways Activated by Nerve Agents
Immune Function	Exposure; Interactions;	HHS-007	Immunotoxicity of Dermal Permethrin and Cis-Urocanic Acid
Immune Function	Exposure; Symptoms	DoD-163	Neuroimmune Effects of Inhaling Low Dose Sarin
Immune Function and Infectious Diseases	Exposure; Symptoms;	DoD-191	Neuroimmune Interactions, Low-Dose Sarin Inhalation, and Gulf War Syndrome
Immune Function	Exposure	DoD-123	Immunotoxicity of Depleted Uranium and Heavy Metal Tungsten Alloys
Immune Function Pyridostigmine Bromide	Exposure; Interactions;	DoD-077	Percutaneous Absorption of Chemical Mixtures Relevant to the Gulf War
Immune Function Symptoms and General Health	Exposure; Symptoms;	DoD-130	Carcinogenicity and Immunotoxicity of Embedded Depleted Uranium and Heavy-Metal Tungsten Alloys in Rodents
Pyridostigmine Bromide	Prevention; Exposure;	DoD-033	Effects of Pyridostigmine in Flinders Line Rats Differing in Cholinergic Sensitivity
Pyridostigmine Bromide	Exposure; Interactions;	DoD-010	Pyridostigmine Synergistic Toxicity Study
Pyridostigmine Bromide; Brain and Nervous System Function	Exposure; Interactions;	DoD-002	Physiological and Neurobehavioral Effects in Rodents from Exposure to Pyridostigmine, Fuels, and DEET
Pyridostigmine Bromide; Brain and Nervous System Function	Exposure; Interactions;	DoD-075	Toxic Interactions of Prophylactic Drugs and Pesticides
Pyridostigmine Bromide; Brain and Nervous System Function	Exposure; Interactions;	DoD-107	Stress, Organophosphates and Blood Brain Barrier Integrity
Pyridostigmine Bromide; Brain and Nervous System Function	Exposure; Interactions; Symptoms	DoD-078	Experimental Models of Gulf War Syndrome
Pyridostigmine Bromide; Brain and Nervous System Function	Exposure; Interactions; Symptoms	DoD-079	Time Course of Stress-induced Impairment of Blood Brain Barrier

Environmental Toxicology

Mechanistic

Research Focus	Project Focus	Project	Project Title
Pyridostigmine Bromide; Brain and Nervous System Function	Exposure; Interactions; Symptoms	DoD-139	Assessment of the Role of Stress-Activated Kinase in the Pathogenesis of Gulf War Illnesses
Pyridostigmine Bromide; Brain and Nervous System Function	Exposure; Interactions; Symptoms	VA-006 C	Neurotoxicity of Environmental Pollutants and Warfare Agents (Project III)
Pyridostigmine Bromide; Brain and Nervous System Function	Exposure; Interactions; Symptoms	VA-080	Neurochemical and Neurobehavioral Impact of Pyridostigmine Bromide Treatment and Stress
Pyridostigmine Bromide; Brain and Nervous System Function	Exposure; Symptoms	DoD-059	Pyridostigmine-induced Neurodegeneration: Role of Neuronal Apoptosis
Pyridostigmine Bromide; Brain and Nervous System Function	Exposure; Symptoms	VA-049	Sensitivity to Pyridostigmine Bromide: Persistent Neural Dysfunction
Pyridostigmine Bromide; Brain and Nervous System Function	Exposure; Symptoms;	VA-106	Interoceptive Stressor Conditioning: A Model for Gulf War Illness
Pyridostigmine Bromide; Brain and Nervous System Function	Exposure; Symptoms;	VA-123	Interactions Between Maternal Care, Stress and Pyridostigmine Bromide
Pyridostigmine Bromide; Brain and Nervous System Function	Exposure; Symptoms;	VA-124	Early Life Determinants of Vulnerability to Pyridostigmine Bromide
Pyridostigmine Bromide; Symptoms and General Health	Exposure; Interactions; Symptoms	VA-005 D	Effects of Genetics and Stress on Responses to Environmental Toxins
Reproductive Health;	Exposure; Symptoms;	DoD-121	Evaluation of the Health Risks of Embedded Depleted Uranium Shrapnel During Pregnancy and Offspring Development
Symptoms and General Health	Exposure	VA-065	San Antonio Environmental Hazards Research Center
Symptoms and General Health	Exposure	VA-065 A	Does a variant of the human SOD2 gene increase sensitivity to hazards?
Symptoms and General Health	Exposure	VA-065 B	The contribution of FEN-1 to genetic integrity subsequent to oxidative stress
Symptoms and General Health	Exposure	VA-065 C	The importance of hydrogen peroxide detoxification in cellular protection
Symptoms and General Health	Exposure	VA-065 D	Do defective Gpx1 and ALDH2 genes increase sensitivity to environmental hazards?
Symptoms and General Health	Symptoms	VA-155	Host Defense Mechanisms in Polyaromatic Hydrocarbon Carcinogenesis
Symptoms and General Health	Exposure; Symptoms	DoD-160	Characterization of the Reproductive Toxicity of Depleted Uranium
Symptoms and General Health	Exposure; Symptoms	DoD-192	Exhaled Gas Frequency Comb Spectroscopy Distinguishing Biomarkers in Gulf War Illness Syndrome
Symptoms and General Health;	Exposure	DoD-007 B	Carcinogenicity of Depleted Uranium Fragments
Symptoms and General Health;	Exposure; Symptoms	DoD-122	Carcinogenic Potential of Depleted Uranium and Tungsten Alloys

Environmental Toxicology

Mechanistic

Research Focus	Project Focus	Project	Project Title
Symptoms and General Health;	Exposure; Symptoms	DoD-127	Depleted Uranium Fragment Carcinogenicity: Extrapolation of Findings in Rodents to Man

Immune Function and Infectious Diseases

Clinical

Research Focus	Project Focus	Project	Project Title
	Diagnosis	DoD-047	Study of Mycoplasmal Infections in GW Veterans
	Symptoms	DoD-048	Assessment of Genomic Instability via Chromosome 7 Inversion Frequency in a Gulf-War Syndrome Cohort vs. Selected Control Groups
	Diagnosis	VA-147	The Diagnosis and Pathogenesis of Occult Leishmaniasis
	Diagnosis; Treatment	VA-006 E	Clinical and Epidemiology Leishmania Research
Brain and Nervous System Function	Symptoms	DoD-088	Clinical Relevance of Novel Immunological Markers in PTSD
Brain and Nervous System Function	Symptoms	VA-017	Immunological Evaluation of Persian Gulf Veterans
Environmental Toxicology	Exposure; Interactions; Symptoms	DoD-106	The Role of Th1/Th2 cytokine balance in Gulf War-related illness
Symptoms and General Health	Treatment; Diagnosis;	DoD-067	Antibacterial Treatment Method Based Upon the Excretion of Dead and Decaying Spherical Bacteria
Symptoms and General Health	Symptoms; Exposure	VA-006 B	Clinical and Neuroendocrine Aspects of Fibromyalgia (Project II)
Symptoms and General Health	Exposure; Interactions;	DoD-162	Evaluation of the Effects of Multiple Immunizations Administered in a Stressful Environment on Immunologic Function
Symptoms and General Health	Exposure; Symptoms;	DoD-042	The Symptomatic Persian Gulf Veterans Protocol: An Analysis of Risk Factors with an Immunologic and Neuropsychiatric Assessment
Symptoms and General Health	Treatment; Symptoms;	DoD-119	Antibiotic Treatment of GW Veterans' Illnesses (ABT) (See also VA-55)
Symptoms and General Health	Treatment; Symptoms;	VA-055	Antibiotic Treatment of GW Veterans' Illnesses (ABT) (See also DoD-119)

Development

Research Focus	Project Focus	Project	Project Title
	Diagnosis	DoD-008 A	Serologic Diagnosis of Viscerotropic Leishmaniasis (VTL)
	Diagnosis	DoD-008 B	Development of a Leishmania Skin Test Antigen (LSTA)
	Diagnosis	DoD-038	Diagnostic Antigens of Leishmania tropica
	Diagnosis	DoD-066	Testing for mycoplasmal infection replicability of nucleoprotein gene tracking and forensic polymerase chain reaction

Immune Function and Infectious Diseases

Development

Research Focus	Project Focus	Project	Project Title
	Diagnosis; Treatment;	DoD-095	Development of Diagnostic tools and alternative treatment drugs for Leishmania
Symptoms and General Health	Diagnosis	DoD-097	Surveillance of B. pertussis among Military Trainees with Respiratory Disease: Development and Validation of a Highly Sensitive PCR and Beacon Probe based Method for Diagnosis of Pertussis
Symptoms and General Health	Prevention; Symptoms;	VA-099	Vaccination Against Visceral Leishmaniasis with a multi-epitope vaccine

Mechanistic

Research Focus	Project Focus	Project	Project Title
	Treatment	DoD-009	Identification of the Genetic Factors Which Control Tropism in Leishmania
	Treatment	DoD-157	Novel Leishmania and Malaria Potassium Channels: Candidate Therapeutic Targets
	Prevention	VA-015	Vaccine-Mediated Immunity Against Leishmaniasis
	Prevention	VA-016	Protective Immunity in Experimental Visceral Leishmaniasis
	Symptoms	VA-127	Interactions of the Leishmania sp. with Mammalian Cells
	Symptoms	DoD-215	Identifying Immune Drivers of Gulf War Illness Using a Novel Daily Sampling Approach
	Prevention; Treatment;	VA-094	The Immunology of Chronic Cutaneous Leishmaniasis
Brain and Nervous System Function	Symptoms	DoD-195	Theory-Driven Models for Correcting "Fight or Flight" Imbalance in Gulf War Illness
Environmental Toxicology	Exposure	DoD-151	Mechanisms and Consequences of Vaccine Effects on Th1/Th2 Balance in GW Veterans
Environmental Toxicology	Exposure; Interactions;	DoD-112	Role of Respirable Saudi Arabian Sand and Pyridostigmine in the Gulf War Syndrome: An Autoimmune Adjuvant Disease?
Environmental Toxicology; Pyridostigmine Bromide	Exposure; Interactions;	DoD-076	Evaluations of Immunotoxicity due to Concurrent Exposure to DEET, Pyridostigmine, and JP-8 Jet Fuel
Environmental Toxicology; Pyridostigmine Bromide	Exposure; Interactions; Symptoms	DoD-081	Immunotoxicity due to Coexposure to DEET, Pyridostigmine, and Stress
Symptoms and General Health	Symptoms	VA-111	T Cell Responses to Multiple Immunizations and Stress
Symptoms and General Health	Treatment; Symptoms	VA-105	Expression of the Major Surface Protease of Leishmania Chagasi

Reproductive Health

Clinical

Research Focus	Project Focus	Project	Project Title
	Symptoms	VA-053	Spouses and Children Program
Environmental Toxicology; Chemical Weapons	Symptoms	VA-047	Retrospective Verification of Mustard Gas Exposure
Immune Function	Symptoms	DoD-044	Investigation of Seminal Plasma Hypersensitivity Reactions

Epidemiology

Research Focus	Project Focus	Project	Project Title
	Prevention	DoD-001 C	Epidemiologic Studies of Morbidity Among GW Veterans: A Search for Etiologic Agents and Risk Factors; Study 3: A comparative study of pregnancy outcomes among Gulf War Veterans and other active-duty personnel
	Prevention	DoD-001 D	Epidemiologic Studies of Morbidity Among GW Veterans: A Search for Etiologic Agents and Risk Factors; Study 4: Infertility and Miscarriage in GW Veterans
	Symptoms	DoD-001 G	Epidemiologic Studies of Morbidity Among GW Veterans: A Search for Etiologic Agents and Risk Factors; Study 7: Prevalence of Congenital Anomalies Among Children of Persian GW Veterans
	Prevention; Symptoms;	DoD-035	Feasibility of Investigating Whether There is a Relationship Between Birth Defects and Service in the Gulf War.
	Prevention; Symptoms;	HHS-004	Suspected Increase of Birth Defects and Health Problems Among Children Born to Persian GW Veterans in Mississippi

Reproductive Health

Mechanistic

Research Focus	Project Focus	Project	Project Title
Environmental Toxicology	Exposure; Symptoms;	DoD-158	Preconceptional Paternal Exposure to Embedded Depleted Uranium Fragments: Transmission of Genetic Damage to Offspring

Symptoms and General Health

Clinical

Research Focus	Project Focus	Project	Project Title
	Symptoms	DoD-001 A	Epidemiologic Studies of Morbidity Among GW Veterans: A Search for Etiologic Agents and Risk Factors; A Study of Symptoms Among 1500 Seabees
	Diagnosis	DoD-109	Disordered Responses to Orthostatic Stress in the Pathogenesis of Gulf War Syndrome Symptoms

Symptoms and General Health

Clinical

Research Focus	Project Focus	Project	Project Title
	Symptoms	VA-018	Chronic Gastrointestinal Illness in Persian Gulf Veterans
	Symptoms	VA-040	Musculoskeletal Symptoms in Gulf War Syndrome
	Treatment; Diagnosis; Symptoms	DoD-172	CNDP1 Polymorphisms and Carnosine Therapy in GWI
	Treatment; Symptoms	DoD-171	Q10 for GW Veterans
	Treatment; Symptoms	DoD-181	Effectiveness of Acupuncture in the Treatment of Gulf War Illness
	Treatment; Symptoms	DoD-186	Small Intestinal Microbial Community in Gulf War Illness
	Treatment	DoD-204	Nasal Irrigation for Chronic Rhinosinusitis and Fatigue in Patients with Gulf War Syndrome
	Treatment; Symptoms	DoD-206	Investigating Clinical Benefits of a Novel Sleep-Focused, Mind-Body Program on Gulf War Illness Symptoms: An Exploratory Randomized Controlled Trial
	Treatment; Symptoms	DoD-216	Intranasal Insulin: A Novel Treatment for Gulf War Multisymptom Illness
	Treatment; Symptoms	VA-056	Birmingham's GW Veterans' Illness Demonstration Clinic
	Treatment; Symptoms	VA-058	Implementation and Evaluation of GW Veterans' Demonstration Project
	Diagnosis; Symptoms;	VA-104	Characterization of Pain Processing Mechanisms in the Irritable Bowel Syndrome
	Treatment; Symptoms;	VA-137	Diarrhea-Predominant Irritable Bowel Syndrome in Persian Gulf Veterans
	Treatment; Symptoms;	VA-153	Bacterial Overgrowth Associated with Chronic Multi- Symptom Illness Complex
	Treatment; Symptoms;	VA-158	Testing the Feasibility of MC CBT for Veterans with IBS
	Treatment	VA-165	A Pilot Study of CPAP Adherence Promotion by Peer Buddies with Sleep Apnea
Brain and Nervous System Function	Symptoms	DoD-036	Fatigue in Persian Gulf Syndrome-Physiologic Mechanisms
Brain and Nervous System Function	Symptoms	DoD-041	Evaluation of Muscle Function in Persian Gulf Veterans
Brain and Nervous System Function	Symptoms	DoD-058	Illness Among Persian GW Veterans: Case Validation Studies
Brain and Nervous System Function	Symptoms	DoD-085	CNS Cytokines and CRH in GW Veterans with Multiple Unexplained Symptoms
Brain and Nervous System Function	Symptoms	DoD-101	Mechanisms in Chronic Multisymptom Illnesses
Brain and Nervous System Function	Symptoms	VA-069	Cardiovascular Hyporeactivity and Fatiguing Illness in Gulf War Veterans
Brain and Nervous System Function	Symptoms	VA-071	Central Nervous System Modulation of Visceral Pain in the Persian Gulf Syndrome

Symptoms and General Health

Clinical

Research Focus	Project Focus	Project	Project Title
Brain and Nervous System Function	Symptoms	VA-073	Pain Sensitivity in GW Veterans with Medically Unexplained Musculoskeletal Pain
Brain and Nervous System Function	Symptoms	VA-082	Pituitary Adrenal Function in People with Fatiguing Illness
Brain and Nervous System Function	Symptoms	VA-096	Functional Imaging of Pain in Veterans with Unexplained Muscle Pain
Brain and Nervous System Function	Symptoms	VA-107	Evaluation of Stress Response Systems in GW Veterans with CMI
Brain and Nervous System Function	Symptoms	VA-134	Autonomic Functions of GW Veterans with Unexplained Illnesses
Brain and Nervous System Function	Symptoms	VA-135	Motor Neuron Function of GW Veterans with Excessive Fatigue
Brain and Nervous System Function	Symptoms	VA-154	Imaging Pain Modulation in GW Veterans with Chronic Muscle Pain
Brain and Nervous System Function	Symptoms; Diagnosis;	DoD-180	Exercise-Induced Cerebrospinal Fluid Proteomic Biomarkers of Fatigue
Brain and Nervous System Function	Diagnosis; Symptoms	DoD-111	Autonomic Dysfunction in GW Veterans
Brain and Nervous System Function	Treatment; Symptoms;	DoD-115	A Randomized, Multi-Center, Controlled Trial of Multi- Modal Therapy in Veterans with Gulf War Illnesses (EBT) (See also VA-62; formerly VA/DoD 1D)
Brain and Nervous System Function	Treatment; Symptoms;	DoD-173	A Randomized, Double-Blind, Placebo-Controlled, Crossover Trial of Mifepristone in GW Veterans with Chronic Multisymptom Illness
Brain and Nervous System Function	Treatment; Symptoms;	DoD-182	Trial of Naltrexone and Dextromethorphan for GW Veterans' Illness
Brain and Nervous System Function	Treatment; Symptoms;	VA-057	Case Management and Residential Rehabilitation for Persian Gulf War Veterans
Brain and Nervous System Function	Treatment; Symptoms;	VA-059	Demonstration Treatment Program for GW Veterans With Unexplained Physical Symptoms (13)
Brain and Nervous System Function	Treatment; Symptoms;	VA-062	A Randomized, Multi-Center, Controlled Trial of Multi- Modal Therapy in Veterans with Gulf War Illness (EBT) (See also DoD-115; formerly VA/DoD 1V)
Brain and Nervous System Function	Treatment; Symptoms	VA-108	Telemedicine Treatment for Veterans with Gulf War Illness
Brain and Nervous System Function	Treatment	VA-166	A Randomized Controlled Trial of a Mindfulness-Based Intervention for Gulf War Syndrome
Brain and Nervous System Function	Treatment	VA-173	Impact of Exercise Training on Pain and Brain Function in Gulf War Veterans
Brain and Nervous System Function;	Diagnosis; Symptoms	DoD-031	Dysregulation of the Stress Response in the Persian Gulf Syndrome
Brain and Nervous System Function	Treatment; Symptoms;	D0D-199	Gulf War Illness: Evaluation of an Innovative Detoxification Program
Environmental Toxicology	Treatment	DoD-177	Randomized Trial of an Environmental Medicine Approach to Gulf War Veterans' Illness
Immune Function	Symptoms	DoD-187	The Use of Comprehensive Molecular Profiling with Network and Control Theory to Better Understand GWI and Model Therapeutic Strategies

Symptoms and General Health

Clinical

Research Focus	Project Focus	Project	Project Title
Immune Function	Symptoms	DoD-188	Epithelial Cell TRPV1-Mediated Airway Sensitivity as a Mechanism for Respiratory Symptoms Associated with Gulf War Illness
Other Topics	Treatment; Symptoms	DoD-196	Probiotic (Bifidobacterium Infantis) for Gulf War Illness

Development

Research Focus	Project Focus	Project	Project Title
	Treatment; Symptoms	DoD-169	Development of Novel Therapy for Chronic Neuropathic Pain
	Diagnosis	DoD-210	Assessment of Diverse Biological Indicators in Gulf War Illness: Are They Replicable? Are They Related?
Brain and Nervous System Function	Diagnosis; Symptoms	DoD-168	Developing Biomarkers for Fibromyalgia
Brain and Nervous System Function	Diagnosis; Treatment;	DoD-209	Proteomic Immune Profiling for the Therapeutic Modulation of Cognitive Impairment in a Novel GWI Mouse Model
Immune Function	Symptoms; Diagnosis;	DoD-183	Biomarkers of GW Veterans' Illnesses: Tissue Factor, Chronic Coagulopathy, and Inflammation

Epidemiology

Research Focus	Project Focus	Project	Project Title
	Symptoms	DoD-001 B	Epidemiologic Studies of Morbidity Among GW Veterans: A Search for Etiologic Agents and Risk Factors; Study 2: A Comparative Study of Hospitalizations among Active-Duty Personnel Who Participated in the Gulf War and Similar Personnel Who Did Not.
	Symptoms	DoD-001 E	Epidemiologic Studies of Morbidity Among GW Veterans: A Search for Etiologic Agents and Risk Factors; Study 5: Seabee Health Study
	Symptoms	DoD-001 F	Epidemiologic Studies of Morbidity Among GW Veterans: A Search for Etiologic Agents and Risk Factors; Study 6: A Comparison of Nonfederal Hospitalization Experience Among Veterans in California who have separated from active service: GWV vs. NDV
	Symptoms	DoD-004	The General Well-Being of Gulf War Era Service Personnel from the States of Pennsylvania and Hawaii: A Survey
	Symptoms	DoD-014	Risk Factors Among US Army Soldiers for Enrolling on the Department of Veterans Affairs Gulf War Registry
	Symptoms	DoD-046	Exploratory Data Analysis with the CCEP Database
	Symptoms	DoD-070	War Syndromes from 1900 to the Present: Symptom Patterns and Long-term Health Outcomes
	Symptoms	DoD-071	A Comparison of Post Deployment Hospitalization Between Vietnam and GW Veterans

Symptoms and General Health

Epidemiology

Research Focus	Project Focus	Project	Project Title
	Symptoms	DoD-098	Investigation of a Baseline Medical Database to Evaluate the Health of Military Forces and Veterans
	Prevention	DoD-110	Predictors of Career and Family Dysfunction in Young Adults Enlisting in the United States Navy
	Symptoms	DoD-116 B	Patterns of Pre-Persian Gulf War Illness and Health Care Seeking, Pilot Study (See also VA-63B; formerly VA/DoD-2DB)
	Symptoms	DoD-120	Assessing the Potential Health Impact of the Gulf War on Saudi Arabia National Guard Members and Their Dependents
	Diagnosis	DoD-140	US DOD Surveillance for Neoplasms in Infancy
	Symptoms	DoD-148	Predicting Operational Readiness for Deployed Army National Guard and Army Reserve Soldiers and Families
	Symptoms	DoD-150	Validation Study of Gulf War Deployment Files
	Symptoms	DoD-203	Redefining Gulf War Illness Using Longitudinal Health Data: The Devens Cohort
	Symptoms	HHS-001	Health Assessment of Persian GW Veterans from Iowa
	Prevention	HHS-009	Improving Health Risk Communications to Prevent Unexplained Illnesses Related to Military Deployments
	Symptoms	HHS-011	Deployment to the Gulf War and the Subsequent Development of Cancer
	Symptoms	VA-002	National Health Survey of Persian Gulf Veterans
	Symptoms	VA-002 A	VA National Survey of Persian Gulf Veterans - Phase I
	Symptoms	VA-002 B	VA National Survey of Persian Gulf Veterans - Phase II
	Symptoms	VA-004 C	Gulf War and Vietnam Veterans Cancer Incidence Surveillance
	Symptoms	VA-046	Diarrhea in Persian Gulf Veterans: An Irritable Bowel-Like Disorder
	Symptoms	VA-063 B	Patterns of Pre-Persian Gulf War Illness and Health Care Seeking Pilot Study (See also DoD-116B; previously VA/DoD-2VB)
	Symptoms	VA-070	A Clinical Evaluation of the Health Status of Persian Gulf War Veterans in VISN 8
	Symptoms	VA-117	Estimates of Cancer Prevalence in Gulf Veterans Using State Registries
	Symptoms	DoD-218	Establishing a 1991 Veterans Research Network To Improve Characterization of Gulf War Illness and Provide a National Resource for Veterans and Investigators
	Symptoms; Exposure;	DoD-073	Post-deployment Morbid Stress, Behavior and Health: Developing a Model for Predicting Morbidity, Mortality, and other Adverse Outcomes

Symptoms and General Health

Epidemiology

Research Focus	Project Focus	Project	Project Title
	Diagnosis; Exposure;	DoD-208	Genome-Wide Association Study of a Validated Case Definition of Gulf War Illness in a Population-Representative Sample
	Prevention; Symptoms	DoD-108	Health Status of Current National Guard Members
	Prevention; Symptoms	DoD-117	Patterns of Pre-Persian Gulf War Illness and Health Care Seeking
	Prevention; Treatment;	HHS-010	Health-e Voice: Optimized Implementation of a Stepped Clinical Risk Communications Guideline
	Symptoms	DoD-015	Comparative Mortality Among US Military Personnel Worldwide During Operations Desert Shield and Desert Storm
	Prevention	DoD-102	Case-Control Study of Fatal Motor Vehicle Crashes Among Gulf War and Non-Deployed Veterans
	Symptoms	VA-001	Mortality Follow-up Study of Persian Gulf Veterans
	Symptoms	VA-148	Profile of GW Veterans Who Applied for Undiagnosed Illness Compensation
	Symptoms;	DoD-217	Efficacy of Treatments Tried: A Survey of GW Veterans
Brain and Nervous System Function	Symptoms	DoD-039	A Controlled Epidemiological and Clinical Study into the Effect of Gulf War Service on Servicemen and Women of the United Kingdom Armed Forces
Brain and Nervous System Function	Symptoms	DoD-141	Physical, Mental, Social, and Family Health Outcomes of Gulf War Veterans
Brain and Nervous System Function	Symptoms	DoD-142	Illnesses Among Persian GW Veterans: Case Validation Studies (Iowa / Great Britain)
Brain and Nervous System Function	Symptoms	DoD-143	Millennium Cohort Study
Brain and Nervous System Function	Symptoms	DoD-149	Longitudinal Health Study of GW Veterans
Brain and Nervous System Function	Symptoms	VA-002 C	VA National Survey of Persian Gulf Veterans - Phase III
Brain and Nervous System Function	Symptoms	VA-005 A	Health and Exposure Survey of Persian Gulf Veterans
Brain and Nervous System Function	Symptoms	VA-078	Millenium Cohort Study
Brain and Nervous System Function	Symptoms	VA-118	Post War Mortality from Neurologic Diseases in Gulf Veterans, 1991-2004
Brain and Nervous System Function	Symptoms; Exposure	VA-156	Gulf War Era Cohort and Biorepository (CSP 585)
Brain and Nervous System Function; Reproductive Health	Symptoms	DoD-045	Air Force Women's Health Surveillance Study
Environmental Toxicology	Symptoms	VA 156	Gulf War Era Cohort and Biorepository (CSP 585)
Environmental Toxicology	Symptoms; Exposure	DoD-074	Relationship of Stress Exposures to Health in GW Veterans
Environmental Toxicology; Chemical Weapons	Exposure; Symptoms;	DoD-116	VA/DoD Core Funding of the Medical Follow-Up Agency (See also VA-63; formerly VA-DoD-2D/2V)

Symptoms and General Health

Epidemiology

Research Focus	Project Focus	Project	Project Title
Environmental Toxicology; Chemical Weapons	Exposure; Symptoms;	VA-063	VA/DoD Core funding of the Medical Follow-Up Agency (See also DoD-116; formerly VA/DoD-2V/2D)
Reproductive Health	Symptoms	DoD-030	Epidemiological Studies Persian Gulf War Illnesses, PG Women's Health Linkage Study
Reproductive Health	Symptoms; Diagnosis; Prevention	DoD-096	Deployment Health Center
Reproductive Health	Symptoms; Prevention	DoD-001	Naval Health Study Program

Mechanistic

Research Focus	Project Focus	Project	Project Title
	Diagnosis	DoD-193	Genome Instability: A Common Link in Gulf War Illness Patients
	Diagnosis	DoD-220	Biomarker Discovery in GW Veterans: Development of a War Illness Diagnostic Panel
	Symptoms	DoD-179	Mechanisms of Mitochondrial Defects in Gulf War Syndrome
	Symptoms	VA-130	Tissue Factor and Gulf War-Associated Chronic Coagulopathies
	Symptoms	VA-131	Neuroendocrine Regulators and Proteomics in GW Veterans with CMI
	Symptoms	VA-136	Central Mechanisms Modulating Visceral Sensitivity
	Symptoms	VA-159	Somatic hypersensitivity in Veterans with IBS
	Symptoms	VA-162	Transcription factors regulating sensory gene expression and pain pathways
	Symptoms	VA-177	Somatic hypersensitivity in Veteraans with IBS
	Symptoms; Treatment;	VA-164	Central Mechanisms Modulating Visceral Sensitivity (renewal of VA-136)
	Symptoms; Treatment;	VA-172	Understanding Pain of Gastrointestinal Origin in Women that Serve in OEF/OIF
Brain and Nervous System Function	Symptoms	VA-115	Autonomic System Changes Cause Intestinal Symptoms in Gulf War Veterans
Brain and Nervous System Function	Symptoms	VA-119	Patterns of Microarray Gene Expression in Gulf War Illness
Brain and Nervous System Function	Symptoms	DoD-194	Homeostatic and Circadian Abnormalities in Sleep and Arousal in Gulf War Syndrome
Brain and Nervous System Function	Symptoms; Treatment	DoD-213	Effectiveness of Accupressure Treatment for Pain Management and Fatigue Relief in GW Veterans
Brain and Nervous System Function	Treatment	DoD-207	Gulf War Illness Research Development Consortium (GWIC)
Environmental Toxicology	Exposure; Symptoms	DoD-174	Autonomic Biomarkers and Treatment for Gulf War Illness
Immune Function	Diagnosis	DoD-200	XMRV and GWI: Is There an Association?

Symptoms and General Health

Mechanistic

Research Focus	Project Focus	Project	Project Title
Immune Function	Diagnosis Symptoms;	DoD-211	Detection of Xenotropic Murine Leukemia Virus-Related Virus (XMRV) in Gulf War Illness: Role in Pathogenesis or Biomarker?
Immune Function	Symptoms	VA-132	Immunologic Mechanisms and Biomarkers in Gulf War Illness
Immune Function	Symptoms	VA-133	Longitudinal Study of Gene Expression and Gene Products in Veterans with Gulf War Illness

Appendix C
Project Funding

(As of September 30, 2012)

NOTES ON REVISED TABLE OF SPENDING FOR GULF WAR VETERANS' ILLNESSES RESEARCH FROM FY 2003-2012

General Notes

1. All entries for research funding reflect money centrally obligated to researchers (both intramural and extramural) to carry out the specific projects. These funds also cover operational costs for administration, infrastructure, etc. Each department allocates these costs in slightly different ways, making it difficult to completely account for these funds. For example, in VA the research appropriation does not pay for clinician/investigator salaries. By law those funds must come from the patient care appropriation. These salary costs are not included in the obligated costs listed in the table.
2. A "blank" funding entry generally reflects years in which a project was not active (e.g., it had not started or it had come to an end).
3. Some multiyear projects receive all of their funding in the fiscal year of the authorization and appropriation. For those, the dollars authorized and obligated are shown for that fiscal year. The remaining funding entries show $0 for the years that the project is active.
4. Although all projects funded from FY 1992-2010 are listed, only the financial data for FY 2003-2012 (a 10-year window) are shown in Appendix C; Totals for FY 2003-2012 do not include funds obligated in FY 1992-2002. Projects that received all of their obligated funds prior to FY 2003 will, therefore, appear in the table as having no funding.
5. Some intramural projects/programs are supported out of operational costs. For those projects, $0 is entered for the funds in the fiscal years that the project is active.
6. Programs consisting of multiple projects are represented in one of two ways depending on how funds are centrally obligated:
   a**. Funds centrally obligated to the program**: These programs are shown in the table as a main program indicated by project designation such as DoD-1, and projects within the program as DoD-1A, DoD-1B, etc. All funds are shown under the main program. Blank funding entries are shown for the individual projects.
   b. **Funds centrally obligated to projects within a program**: The funds for these programs are only indicated by their projects without a main program identifier, for example, VA-2A and VA-2B.

Specific Notes

1. DoD-4 is part of a larger US Army study conducted at Walter Reed Army Institute of Research. Funding for this project has been combined into project DoD-23. In addition, projects DoD-8A and 8B are part of a larger US Army study in which all funding has been combined and is shown under program DoD-8.
2. HHS-3 was funded from the FY'91 appropriation, which is not included in this accounting.
3. HHS-4 was funded from the FY'93 appropriation, which is not included in this accounting.
4. Funds for VA-1 for FY'94 through FY'97 represent an aggregate of funds for both the VA Mortality Study and the VA National Survey of Persian Gulf Veterans. Beginning in FY'98, VA-1 reflects continuation of the VA Mortality Study. Beginning in FY'98, VA–2A, 2B, and 2C reflect funding for separate components of the VA National Survey of Persian Gulf Veterans.
5. In nine instances (DoD-115 & VA-062, DoD-116 & VA-063, DoD-116A & VA-063A, DoD-116B & VA-063B, DoD-118 & VA-061, DoD-119 &VA-055, DoD-125 & VA-074, DoD-143 & VA-078 ,and DoD154 & VA-88), two different designations represent the same project because both DoD and VA funded them jointly. The total funding appropriated for each of these nine projects is broken down and reported separately by funding agency.

Department of Defense Gulf War Research Funding

PROJECT NO	PROJECT TITLE	STATUS	FY 2003	FY2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY2012	TOTALS FY 03-12
DoD-001	Naval Health Study Program	C											$0
DoD-001 A	Epidemiologic Studies of Morbidity Among GW Veterans: A Search for Etiologic Agents and Risk Factors; A Study of Symptoms Among 1500 Seabees	C											$0
DoD-001 B	Epidemiologic Studies of Morbidity Among GW Veterans: A Search for Etiologic Agents and Risk Factors; Study 2: A Comparative Study of Hospitalizations among Active-Duty Personnel Who Participated in the Gulf War and Similar Personnel Who Did Not.	C											$0
DoD-001 C	Epidemiologic Studies of Morbidity Among GW Veterans: A Search for Etiologic Agents and Risk Factors; Study 3: A comparative study of pregnancy outcomes among GW Veterans and other active-duty personnel	C											$0
DoD-001 D	Epidemiologic Studies of Morbidity Among GW Veterans: A Search for Etiologic Agents and Risk Factors; Study 4: Infertility and Miscarriage in GW Veterans	C											$0
DoD-001 E	Epidemiologic Studies of Morbidity Among GW Veterans: A Search for Etiologic Agents and Risk Factors; Study 5: Seabee Health Study	C											$0
DoD-001 F	Epidemiologic Studies of Morbidity Among GW Veterans: A Search for Etiologic Agents and Risk Factors; Study 6: A Comparison of Nonfederal Hospitalization Experience Among Veterans in California who have separated from active service: GWV vs. NDV	C											$0
DoD-001 G	Epidemiologic Studies of Morbidity Among GW Veterans: A Search for Etiologic Agents and Risk Factors; Study 7: Prevalence of Congenital Anomalies Among Children of Persian GW Veterans	C											$0

*****Totals for FY '03 -'12 do not include funds obligated in FY 1992 -2002

Department of Defense Gulf War Research Funding

PROJECT NO	PROJECT TITLE	STATUS	FY 2003	FY2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY2012	TOTALS FY 03-12
DoD-002	Physiological and Neurobehavioral Effects in Rodents from Exposure to Pyridostigmine, Fuels, and DEET	C											$0
DoD-004	The General Well-Being of Gulf War Era Service Personnel from the States of Pennsylvania and Hawaii: A Survey	C											$0
DoD-007 A	Health Risk Assessment of Embedded Depleted Uranium: Behavior, Physiology, Histology, and Biokinetic Modeling	C											$0
DoD-007 B	Carcinogenicity of Depleted Uranium Fragments	C											$0
DoD-008	Program DoD-8.	C											$0
DoD-008 A	Serologic Diagnosis of Viscerotropic Leishmaniasis (VTL)	C											$0
DoD-008 B	Development of a Leishmania Skin Test Antigen (LSTA)	C											$0
DoD-009	Identification of the Genetic Factors Which Control Tropism in Leishmania	C											$0
DoD-010	Pyridostigmine Synergistic Toxicity Study	C											$0
DoD-011	Male/Female Differential Tolerances to Pyridostigmine Bromide	C											$0
DoD-013	Effects of Persian Gulf War Service on Military Working Dogs	C	$0	$0									$0
DoD-014	Risk Factors Among US Army Soldiers for Enrolling on the Department of Veterans Affairs Gulf War Registry	C											$0
DoD-015	Comparative Mortality Among US Military Personnel Worldwide During Operations Desert Shield and Desert Storm	C											$0
DoD-016	Kuwait Oil Fire Health Risk Assessment	C											$0
DoD-017	Retrospective Studies Involving Military Use of Pyridostigmine as a Pretreatment for Nerve Agent Poisoning	C											$0
DoD-018	Kuwait Oil Fires Troop Exposure Assessment Model (TEAM)	C	$225,000										$225,000
DoD-019	Persian Gulf Veterans Health Tracking System	C	$50,000										$50,000

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Department of Defense Gulf War Research Funding

PROJECT NO	PROJECT TITLE	STATUS	FY 2003	FY2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY2012	TOTALS FY 03-12
DoD-021	Study of Variability In Pyridostigmine Inhibition of Blood Cholinesterases in Healthy Adults and Individuals With Symptoms Following Participation in Operation Desert Storm	C											$0
DoD-022	Chronic Organophosphorus Exposure and Cognition	C											$0
DoD-023	Acute and Long-Term Impact of Deployment to Southwest Asia on the Physical and Mental Health of Soldiers and their Families	C											$0
DoD-030	Epidemiological Studies Persian Gulf War Illnesses, PG Women's Health Linkage Study	C											$0
DoD-031	Dysregulation of the Stress Response in the Persian Gulf Syndrome	C											$0
DoD-032	Neuropsychological Functioning in Persian Gulf Era Veterans	C											$0
DoD-033	Effects of Pyridostigmine in Flinders Line Rats Differing in Cholinergic Sensitivity	C											$0
DoD-034	Characterization of Emissions from Heaters Burning Leaded Diesel Fuel in Unvented Tents	C											$0
DoD-035	Feasibility of Investigating Whether There is a Relationship Between Birth Defects and Service in the Gulf War.	C											$0
DoD-036	Fatigue in Persian Gulf Syndrome-Physiologic Mechanisms	C											$0
DoD-037	Neurobehavioral and Immunological Toxicity of Pyridostigmine, Permethrin, and DEET in Male and Female Rats	C											$0
DoD-038	Diagnostic Antigens of Leishmania tropica	C											$0
DoD-039	A Controlled Epidemiological and Clinical Study into the Effect of Gulf War Service on Servicemen and Women of the United Kingdom Armed Forces	C											$0
DoD-040	Psychological and Neurobiological Consequences of the Gulf War Experience	C											$0
DoD-041	Evaluation of Muscle Function in Persian Gulf Veterans	C											$0

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Department of Defense Gulf War Research Funding

PROJECT NO	PROJECT TITLE	STATUS	FY 2003	FY2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY2012	TOTALS FY 03-12
DoD-042	The Symptomatic Persian Gulf Veterans Protocol: An Analysis of Risk Factors with an Immunologic and Neuropsychiatric Assessment	C											$0
DoD-044	Investigation of Seminal Plasma Hypersensitivity Reactions	C											$0
DoD-045	Air Force Women's Health Surveillance Study	C											$0
DoD-046	Exploratory Data Analysis with the CCEP Database	C											$0
DoD-047	Study of Mycoplasmal Infections in GW Veterans	C											$0
DoD-048	Assessment of Genomic Instability via Chromosome 7 Inversion Frequency in a Gulf-War Syndrome Cohort vs. Selected Control Groups	C											$0
DoD-049	Diagnosis and Dosimetry of Exposure to Sulfur Mustard: Development of Standard Operating Procedures and Exploratory Research on Protein Adducts	C											$0
DoD-050	Toxicokinetics of 0-Ethyl S-(2-Diisopropylaminoethyl) Methylphosphonothioate [(+)-VX] in Rats, Hairless Guinea Pigs and Marmosets - Identification of Metabolic Pathways	C											$0
DoD-051	Transgenic Engineering of Cholinesterases: Tools for Exploring Cholinergic Responses	C											$0
DoD-052	Female Gender and Other Potential Predictors of Functional Health Status Among Persian GW Veterans	C											$0
DoD-053	Long-Term Effects of Subclinical Exposures to Sarin	C											$0
DoD-054	Assessment of Subchronic Neurobehavioral and Neuropathologic Effects in Rats Following Low-Level Sarin Exposure	C											$0
DoD-055	Low-Level Exposure to GB Vapor in Air: Diagnosis/Dosimetry, Lowest Observable Effect Levels, Performance-Incapacitation, and Possible Delayed Effects	C											$0

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Department of Defense Gulf War Research Funding

PROJECT NO	PROJECT TITLE	STATUS	FY 2003	FY2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY2012	TOTALS FY 03-12
DoD-056	Low-Level Sarin Neurotoxicity and Its Modulation by Pyridostigmine	C											$0
DoD-057	Physiologic Effects of Stress in GW Veterans	C	$0										$0
DoD-058	Illness Among Persian GW Veterans: Case Validation Studies	C	$0	$0									$0
DoD-059	Pyridostigmine-induced Neurodegeneration: Role of neuronal Apoptosis	C											$0
DoD-060	Butyrylcholinesterase Genetic Variants in Persons with Gulf War Illness	C											$0
DoD-061	Neurophysiologic and Neuropathologic Effects in Monkeys of Low Level Exposures to Sarin, Pyridostigmine, Pesticides, and Botulinum Toxoid	C											$0
DoD-062	Sarin and Pyridostigmine Interaction under Physical Stress: Neurotoxic Effects in Mice	C											$0
DoD-063	PGW Veterans: Epidemiological and Clinical Evidence for Residual Organophosphate Neurotoxicity	C											$0
DoD-064	Individual Differences in Neurobehavioral Effects of Pyridostigmine	C											$0
DoD-065	Multi-disciplinary Pathophysiologic Studies of Neurotoxic Gulf War Related Syndromes Leading to Diagnosis and Treatment	C											$0
DoD-066	Testing for mycoplasmal infection replicability of nucleoprotein gene tracking and forensic polymerase chain reaction	C											$0
DoD-067	Antibacterial Treatment Method Based Upon the Excretion of Dead and Decaying Spherical Bacteria	C											$0
DoD-069	Five Year Follow-Up of Army Personnel Exposed to Chemical Warfare Agents	C	$0	$0	$0	$0							$0
DoD-070	War Syndromes from 1900 to the Present: Symptom Patterns and Long-term Health Outcomes	C											$0

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Department of Defense Gulf War Research Funding

PROJECT NO	PROJECT TITLE	STATUS	FY 2003	FY2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY2012	TOTALS FY 03-12
DoD-071	A Comparison of Post Deployment Hospitalization Between Vietnam and GW Veterans	C											$0
DoD-072	Long-term Effects of Subchronic Exposure to Sarin, Alone and with Stress or Other Chemicals	C	$0										$0
DoD-073	Post-deployment Morbid Stress, Behavior and Health: Developing a Model for Predicting Morbidity, Mortality, and other Adverse Outcomes	C											$0
DoD-074	Relationship of Stress Exposures to Health in GW Veterans	C	$0										$0
DoD-075	Toxic Interactions of Prophylactic Drugs and Pesticides	C	$0	$0									$0
DoD-076	Evaluations of Immunotoxicity due to Concurrent Exposure to DEET, Pyridostigmine, and JP-8 Jet Fuel	C	$0	$0									$0
DoD-077	Percutaneous Absorption of Chemical Mixtures Relevant to the Gulf War	C	$0										$0
DoD-078	Experimental Models of Gulf War Syndrome	C	$0										$0
DoD-079	Time Course of Stress-induced Impairment of Blood Brain Barrier	C											$0
DoD-080	Molecular Regulation of Corticosteroid Receptor Expression in Stress-Responsive Cells	C	$0										$0
DoD-081	Immunotoxicity due to Coexposure to DEET, Pyridostigmine, and Stress	C	$0										$0
DoD-082	Feasibility of Developing a Registry of PTSD Affected Veteran Sib Pairs	C	$0										$0
DoD-083	Risk for Stress-related Substance Abuse: the Effects of Family History of Alcoholism	C	$0										$0
DoD-084	Psychobiologic Alterations in Persian GW Veterans with and without PTSD	C	$0										$0
DoD-085	CNS Cytokines and CRH in GW Veterans with Multiple Unexplained Symptoms	C	$0										$0
DoD-086	Effects of Combat Stress on Structure and Function of the Hippocampus	C	$0	$0									$0
DoD-087	Measurement and Validation of Psychosocial Risk and Resilience Factors Accounting for Physical and Mental Health and Health-Related	C	$0	$0									$0

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PROJECT NO	PROJECT TITLE	STATUS	FY 2003	FY2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY2012	TOTALS FY 03-12
	Quality of Life among PGWVs												
DoD-088	Clinical Relevance of Novel Immunological Markers in PTSD	C	$0										$0
DoD-089	Limbic Blood Flow and Opiate Receptor PET in Posttraumatic Stress Disorder	C	$0										$0
DoD-090	SPECT Benzodiazepine Receptor and MR Imaging in PTSD	C											$0
DoD-091	Neurological and Circadian Substrates of PTSD-like Behaviors	C											$0
DoD-092	Traumatic Experiences Persistently Enhance Cue-dependent Learning: Toward an Animal Model of Chronic Stress and Posttraumatic Stress Disorder	C											$0
DoD-093	Troops Exposed to Nerve Agents at Aberdeen Proving Ground: Follow-Up	C											$0
DoD-094	Combined Analysis of the VA and DoD Gulf War Clinical Registries: A Study of Clinical Findings from Systematic Medical Examinations of 100,000 U.S. GW Veterans	C											$0
DoD-095	Development of Diagnostic tools and alternative treatment drugs for Leishmania	C											$0
DoD-096	Deployment Health Center	C	$1,750,000	$1,750,000	$0								$3,500,000
DoD-097	Surveillance of B. pertussis among Military Trainees with Respiratory Disease: Development and Validation of a Highly Sensitive PCR and Beacon Probe based Method for Diagnosis of Pertussis	C											$0
DoD-098	Investigation of a Baseline Medical Database to Evaluate the Health of Military Forces and Veterans	C	$0	$0	$0	$0	$0	$0	$0				$0
DoD-099	DoD-wide Medical Surveillance for Potential Long-Term Adverse Events associated with Anthrax Immunization in Active Duty Service Members, Proposal 1:	C	$0	$0									$0

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Department of Defense Gulf War Research Funding

PROJECT NO	PROJECT TITLE	STATUS	FY 2003	FY2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY2012	TOTALS FY 03-12
	Hospitalizations												
DoD-100	Antibodies to Squalene	C	$0	$0	$0	$0	$0						$0
DoD-101	Mechanisms in Chronic Multisymptom Illnesses	C	$644,870	$4,781,952	$2,429,999	$0	$0	$0	$0				$7,856,821
DoD-102	Case-Control Study of Fatal Motor Vehicle Crashes Among Gulf War and Non-Deployed Veterans	C	$281,950										$281,950
DoD-103	Human Metabolism and Interactions of Deployment-related Chemicals	C	$349,994	$242,424	$160,000	$326,570	$166,570	$0	$0				$1,245,558
DoD-104	Clinical Evaluation of a Proposed New Gulf War Syndrome	C	$40,844										$40,844
DoD-105	Neuroplasticity and Calcium Signaling in Stressed Rat Amygdala	C	$0	$0									$0
DoD-106	The Role of Th1/Th2 cytokine balance in Gulf War-related illness	C	$0										$0
DoD-107	Stress, Organophosphates and Blood Brain Barrier Integrity	C	$0	$0									$0
DoD-108	Health Status of Current National Guard Members	C	$0	$0	$0								$0
DoD-109	Disordered Responses to Orthostatic Stress in the Pathogenesis of Gulf War Syndrome Symptoms	C	$0										$0
DoD-110	Predictors of Career and Family Dysfunction in Young Adults Enlisting in the United States Navy	C	$0										$0
DoD-111	Autonomic Dysfunction in GW Veterans	C	$189,609	$0	$0								$189,609
DoD-112	Role of Respirable Saudi Arabian Sand and Pyridostigmine in the Gulf War Syndrome: An Autoimmune Adjuvant Disease?	C	$0										$0
DoD-113	Interactions of Subsymptomatic Doses of Sarin with Pyridostigmine: Neurochemical, Behavioral, and Physiological Effects	C	$0	$0	$0								$0
DoD-114	A Re-examination of Neuropsychological Functioning in Persian GW Veterans	C	$0										$0
DoD-115	A Randomized, Multi-Center, Controlled Trial of Multi-Model	C	$0										$0

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	Therapy in Veterans with Gulf War Illnesses (EBT) (See also VA-62; formerly VA/DoD 1D)												
DoD-116	VA/DoD Core Funding of the Medical Follow-Up Agency (See also VA-63; formerly VA-DoD-2D/2V)	C	$250,000										$250,000
DoD-116 A	Follow-Up Investigation of Troops Exposed to Nerve Agents at Aberdeen Proving Ground (Pilot Study) (See also VA-63A; formerly VA/DoD-2DA)	C											$0
DoD-116 B	Patterns of Pre-Persian Gulf War Illness and Health Care Seeking, Pilot Study (See also VA-63B; formerly VA/DoD- 2DB)	C											$0
DoD-117	Patterns of Pre-Persian Gulf War Illness and Health Care Seeking	C	$0										$0
DoD-118	An Epidemiological Investigation into the Occurrence of Amyotrophic Lateral Sclerosis (ALS) Among GW Veterans (See also VA-61)	C	$0										$0
DoD-119	Antibiotic Treatment of GW Veterans' Illnesses (ABT) (See also VA-55)	C	$0										$0
DoD-120	Assessing the Potential Health Impact of the Gulf War on Saudi Arabia National Guard Members and Their Dependents	C	$0										$0
DoD-121	Evaluation of the Health Risks of Embedded Depleted Uranium Shrapnel During Pregnancy and Offspring Development	C											$0
DoD-122	Carcinogenic Potential of Depleted Uranium and Tungsten Alloys	C											$0
DoD-123	Immunotoxicity of Depleted Uranium and Heavy Metal Tungsten Alloys	C											$0
DoD-124	Randomized, Controlled Trial for Combination Treatment with Pyridostigmine, DEET, and Permethrin	C	$0	$0	$0	$0							$0
DoD-125	A Randomized Clinical Trial of Cognitive-Behavioral Treatment for PTSD in Women (See VA-74)	C	$0	$0	$0	$0							$0
DoD-126	Blood-Brain Barrier Transport of Uranium	C	$0	$0	$0	$0	$0	$0	$0				$0

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DoD-127	Depleted Uranium Fragment Carcinogenicity: Extrapolation of Findings in Rodents to Man	C	$0	$0									$0
DoD-128	Multifactorial Assessment of Depleted Uranium Neurotoxicity	C	$328,734	$0	$89,055	$0	$0	$0	$0				$417,789
DoD-129	Inhalation of Uranium Oxide Aerosol: CNS Deposition, Neurotoxicity, and Role in Gulf War Illness	C	$0	$0	$0	$0	$0	$0	$0				$0
DoD-130	Carcinogenicity and Immunotoxicity of Embedded Depleted Uranium and Heavy-Metal Tungsten Alloys in Rodents	C	$0	$0	$0	$0	$0	$0	$0				$0
DoD-131	Magnetic Resonance and Spectroscopy of the Human Brain in Gulf War Illnesses	C	$500,000	$0	$0	$0	$0	$0	$0				$500,000
DoD-132	Impaired Auditory Sensory Gating, Acoustic Startle Response: Effects of Long and Short Deployments on Army Combat Readiness	C	$0	$0	$0	$0	$0						$0
DoD-133	Odors, Deployment Stress, and Health: A Conditioning Analysis of Gulf War Syndrome	C	$0	$0	$0	$0	$0						$0
DoD-134	Identification and Development of Biological Markers of Human Exposure to the Insecticide Permethrin	C	$0	$0	$0	$0	$0						$0
DoD-135	Biochemical Markers for Exposure to Low Doses of Organophosphorus Exposure	C	$0	$0	$0								$0
DoD-136	A Mechanism-Based, Molecular Fingerprint Strategy for Detecting Biomarkers of Organophosphate Exposure	C	$0	$0	$0								$0
DoD-137	Low Level Exposure to Sulfur Mustard: Development of a SOP for Analysis of Albumin Adducts and of a System for Non-Invasive Diagnosis on Skin	C	$0	$0	$0	$0							$0
DoD-138	Improving Blood Monitoring of Enzymes as Biomarkers of Risk from Anticholinergic Pesticides and Chemical Warfare Agents	C	$0	$0	$0	$0	$0						$0
DoD-139	Assessment of the Role of Stress-Activated Kinase in the Pathogenesis of Gulf War Illnesses	C	$0										$0

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DoD-140	US DOD Surveillance for Neoplasms in Infancy	C	$0	$0	$0	$0							$0
DoD-141	Physical, Mental, Social, and Family Health Outcomes of GW Veterans	C	$0										$0
DoD-142	Illnesses Among Persian GW Veterans: Case Validation Studies (Iowa / Great Britain)	C	$168,962	$0	$0								$168,962
DoD-143	Millennium Cohort Study	O	$2,000,000	$1,950,000	$2,880,000	$2,893,000	$3,251,000	$3,160,000	$3,145,000	$3,306,000	$3,347,000	$3,676,000	$29,608,000
DoD-144	Psychological Health Screening: Methods and Metrics for Deployed Forces	C	$0	$0	$0	$0	$0	$0	$0				$0
DoD-145	Early Intervention Research Program to Enhance Soldier Resilience	C	$275,000	$0	$0	$0	$0	$0	$0	$0			$275,000
DoD-146	Assessment of Toxicology Assay Methods and Chemical Exposures Among a Cohort of US Marines Deployed in the Gulf War	C											$0
DoD-147	Development and Validation of the Automated Neuropsychological Assessment Metric (ANAM) for Deployment Health Monitoring Applications	C	$292,530	$0	$0	$0							$292,530
DoD-148	Predicting Operational Readiness for Deployed Army National Guard and Army Reserve Soldiers and Families	C											$0
DoD-149	Longitudinal Health Study of GW Veterans	C	$0	$0	$0	$0							$0
DoD-150	Validation Study of Gulf War Deployment Files	C	$0										$0
DoD-151	Mechanisms and Consequences of Vaccine Effects on Th1/Th2 Balance in GW Veterans	C	$0	$0	$0	$0							$0
DoD-152	Characterization of Intracellular Signaling Pathways Activated by Nerve Agents	C	$1,019,440	$0	$0	$0	$0	$0	$0				$1,019,440
DoD-153	Gulf War Illness Research	C	$920,838	$2,003,000	$928,000	$0							$3,851,838
DoD-154	Prospective Assessment of Neurocognition in Future Gulf-deployed and Gulf-nondeployed Military Personnel: A Pilot Study	C	$100,000	$566,542	$368,687	$604,372	$0	$0	$0	$0			$1,639,601
DoD-155	Neuropsychological Functioning in GW Veterans Exposed to Pesticides and Pyridostigmine Bromide	C	$1,021,862	$0	$0	$0	$0	$0					$1,021,862
DoD-156	The Effects of Diesel Exhaust and Stress on the Acute Phase Response	C	$1,519,951	$0	$0	$0	$0	$0					$1,519,951

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	and Symptoms in the Chemically Intolerant												
DoD-157	Novel Leishmania And Malaria Potassium Channels: Candidate Therapeutic Targets	C	$0	$0	$0								$0
DoD-158	Preconceptional Paternal Exposure to Embedded Depleted Uranium Fragments: Transmission Of Genetic Damage To Offspring	C	$0	$0	$0								$0
DoD-159	Neurotoxicity from Chronic Exposure to Depleted Uranium	C	$0	$0	$0								$0
DoD-160	Characterization of the Reproductive Toxicity of Depleted Uranium	C	$0	$0	$0								$0
DoD-161	Glutamate Receptor Aptamers and ALS	C	$1,152,744		$0	$0	$0	$0					$1,152,744
DoD-162	Evaluation of the Effects of Multiple Immunizations Administered in a Stressful Environment on Immunologic Function	C	$1,041,751	$0	$0	$0	$0	$0					$1,041,751
DoD-163	Neuroimmune Effects of Inhaling Low Dose Sarin	C	$1,828,876	$0	$0	$0	$0	$0					$1,828,876
DoD-164	Efficacy of Adjunct Sleep Interventions For PTSD (EASI-PTSD)	C			$999,623	$0	$0	$0					$999,623
DoD-165	Biomarkers for Amyotrophic Lateral Sclerosis in Active Duty Military - BALSAM	C			$1,000,799	$0	$0	$0					$1,000,799
DoD-166	A Placebo-Controlled Trial of Prazosin vs. Paroxetine in Combat Stress-Induced PTSD Nightmares and Sleep Disturbance	C			$1,000,000	$0	$0	$0					$1,000,000
DoD-167	Mass Spectrometry to Identify New Biomarkers of Nerve Agent Exposure	C				$637,848	$0	$0	$0				$637,848
DoD-168	Developing Biomarkers for Fibromyalgia	C				$936,067	$0	$0	$0				$936,067
DoD-169	Development of Novel Therapy for Chronic Neuropathic Pain	C				$840,574	$0	$0	$0				$840,574
DoD-170	Structural MRI and Cognitive Correlates in Pest-Control Personnel from Gulf War I	C				$208,353	$0	$0	$0				$208,353
DoD-171	Q10 for GW Veterans	C				$718,261	$0	$0	$0				$718,261
DoD-172	CNDP1 Polymorphisms and Carnosine Therapy in GWI	C				$831,200	$0	$0	$0				$831,200
DoD-173	A Randomized, Double-Blind,	C				$650,279	$0	$0	$0				$650,279

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	Placebo-Controlled, Crossover Trial of Mifepristone in GW Veterans with Chronic Multisymptom Illness												
DoD-174	Autonomic Biomarkers and Treatment for Gulf War Illness	C				$687,530	$0	$0	$0				$687,530
DoD-175	Novel Pharmacological Approaches for Treatment of Neurotoxicity Induced by Chronic Exposure to Depleted Uranium	C				$767,061	$0	$0	$0				$767,061
DoD-176	Studies on Axonal Transport in an Animal Model for Gulf War Syndrome	C				$112,500	$0	$0	$0				$112,500
DoD-177	Randomized Trial of an Environmental Medicine Approach to GW Veterans' Illness	C				$445,865	$0	$0	$0				$445,865
DoD-178	Analysis of Paraoxonase Status among US Navy GW Veterans with Increased Postwar Symptoms, Psychological Morbidity and Medical Conditions	C				$73,153	$0	$0	$0				$73,153
DoD-179	Mechanisms of Mitochondrial Defects in Gulf War Syndrome	C						$440,674	$0	$0	$0		$440,674
DoD-180	Exercise-Induced Cerebrospinal Fluid Proteomic Biomarkers of Fatigue	C						$921,000	$0	$0	$0		$921,000
DoD-181	Effectiveness of Acupuncture in the Treatment of Gulf War Illness	C						$1,015,733	$0	$0	$0		$1,015,733
DoD-182	Trial of Naltrexone and Dextromethorphan for GW Veterans' Illness	C						$1,063,641	$0	$0	$0		$1,063,641
DoD-183	Biomarkers of GW Veterans' Illnesses: Tissue Factor, Chronic Coagulopathy, and Inflammation	C						$653,460	$0	$0	$0		$653,460
DoD-184	Treatment of Memory Impairment and Sensorimotor Deficits in an Animal Model for the GW Veterans' Illnesses	C						$311,135	$0	$0	$0		$311,135
DoD-185	Neuroinflammatory Pathobiology in Gulf War Illness: Characterization with an Animal Model	C						$718,326	$0	$0	$0		$718,326
DoD-186	Small Intestinal Microbial Community in Gulf War Illness	C						$634,142	$0	$0	$0		$634,142
DoD-187	The Use of Comprehensive Molecular Profiling with Network and Control Theory to Better Understand GWI and Model Therapeutic Strategies	C						$715,456	$0	$0	$0		$715,456

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PROJECT NO	PROJECT TITLE	STATUS	FY 2003	FY2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY2012	TOTALS FY 03-12
DoD-188	Epithelial Cell TRPV1-Mediated Airway Sensitivity as a Mechanism for Respiratory Symptoms Associated with Gulf War Illness	C						$842,400	$0	$0	$0		$842,400
DoD-189	Discovery of AMPA Receptor Potentiating Aptamers as Cognitive Enhancers	C						$303,000	$0	$0	$0		$303,000
DoD-190	Identification of Biological Pathways Implicated in Hippocampal Dysfunction and Cognitive Impairment in Gulf War Illness	C						$894,000	$0	$0	$0		$894,000
DoD-191	Neuroimmune Interactions, Low-Dose Sarin Inhalation, and Gulf War Syndrome	O							$1,247,995	$0	$0		$1,247,995
DoD-192	Exhaled Gas Frequency Comb Spectroscopy Distinguishing Biomarkers in Gulf War Illness Syndrome	O							$742,296	$0	$0		$742,296
DoD-193	Genome Instability: A Common Link in Gulf War Illness Patients	O							$904,364	$0	$0		$904,364
DoD-194	Homeostatic and Circadian Abnormalities in Sleep and Arousal in Gulf War Syndrome	O							$705,654	$0	$0		$705,654
DoD-195	Theory-Driven Models for Correcting "Fight or Flight" Imbalance in Gulf War Illness	O							$678,953	$0	$0		$678,953
DoD-196	Probiotic (Bifidobacterium Infantis) for Gulf War Illness	O							$466,260	$0	$0		$466,260
DoD-197	Undiagnosed Small Fiber Polyneuropathy: Is It a Component of Gulf War Illness?	O							$929,224	$0	$0		$929,224
DoD-198	Oxidative Stress	O							$927,000	$0	$0		$927,000
DoD-199	Gulf War Illness: Evaluation of an Innovative Detoxification Program	O							$633,677	$0	$0		$633,677
DoD-200	XMRV and GWI: Is There an Association?	O								$565,794	$0		$565,794
DoD-201	Synergistic Actions of Pyridostigmine Bromide and Insecticides on Muscle and Vascular Nociceptors	O								$852,157	$0		$852,157
DoD-202	Brain-Immune Interactions as Basis of Gulf War Illness: Consortium Development	O								$262,052	$0		$262,052
DoD-203	Redefining Gulf War Illness Using Longitudinal Health Data: The	O								$708,169	$0		$708,169

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Department of Defense Gulf War Research Funding

PROJECT NO	PROJECT TITLE	STATUS	FY 2003	FY2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY2012	TOTALS FY 03-12
	Devens Cohort												
DoD-204	Nasal Irrigation for Chronic Rhinosinusitis and Fatigue in Patients with Gulf War Syndrome	O								$668,072	$0		$668,072
DoD-205	The HPA Axis and Metabolic Outcomes in GW Veterans	O								$699,933	$0		$699,933
DoD-206	Investigating Clinical Benefits of a Novel Sleep-Focused, Mind-Body Program on Gulf War Illness Symptoms: An Exploratory Randomized Controlled Trial	O								$606,496	$0		$606,496
DoD-207	Gulf War Illness Research Development Consortium (GWIC)	O								$251,475	$0		$251,475
DoD-208	Genome-Wide Association Study of a Validated Case Definition of Gulf War Illness in a Population-Representative Sample	O								$140,357	$0		$140,357
DoD-209	Proteomic Immune Profiling for the Therapeutic Modulation of Cognitive Impairment in a Novel GWI Mouse Model	O								$925,368	$0		$925,368
DoD-210	Assessment of Diverse Biological Indicators in Gulf War Illness: Are They Replicable? Are They Related?	O								$741,013	$0		$741,013
DoD-211	Detection of Xenotropic Murine Leukemia Virus-Related Virus (XMRV) in Gulf War Illness: Role in Pathogenesis or Biomarker?	O								$403,050	$0		$403,050
DoD-212	Integrative Physiology of Gulf War Illness: Role of Autonomic Function, Central Neural Processing, and Sleep	O								$254,295	$0		$254,295
DoD-213	Effectiveness of Acupressure Treatment for Pain Management and Fatigue Relief in GW Veterans										$677,280		$677,280
DoD-214	Abnormalities in Human Brain Creatine Metabolism in Gulf War Illness Probed with MRS										$878,051		$878,051
DoD-215	Identifying Immune Drivers of Gulf War Illness Using a Novel Daily Sampling Approach										$900,642		$900,642
DoD-216	Intranasal Insulin: A Novel Treatment for Gulf War Multisymptom Illness										$1,492,571		$1,492,571
DoD-217	Efficacy of Treatments Tried: A Survey of GW Veterans										$527,365		$527,365

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Department of Defense Gulf War Research Funding

PROJECT NO	PROJECT TITLE	STATUS	FY 2003	FY2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY2012	TOTALS FY 03-12
DoD-218	Establishing a 1991 Veterans Research Network To Improve Characterization of Gulf War Illness and Provide a National Resource for Veterans and Investigators										$814,165		$814,165
DoD-219	Organophosphate-Related Alterations in Myelin and Axonal Transport in the Living Mammalian Brain										$859,673		$859,673
DoD-220	Biomarker Discovery in GW Veterans: Development of a War Illness Diagnostic Panel										$784,175		$784,175
			$16,419,497	$11,096,063	$10,091,848	$10,128,261	$3,417,570	$11,672,967	$10,380,423	$10,384,231	$10,280,922	$3,676,000	$97,647,782

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Department of Health and Human Services Gulf War Research Funding

PROJECT NO	PROJECT TITLE	STATUS	FY 2003	FY2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	TOTALS FY 03-12
HHS-001	Health Assessment of Persian GW Veterans from Iowa	C											$0
HHS-002	Disease Cluster in a Pennsylvania Air National Guard Unit, EPI-AID 95-18	C											$0
HHS-003	Biomarkers of Susceptibility and Polycyclic Aromatic Hydrocarbon (PAH) Exposure in Urine and blood Cell DNA from U.S. Army Soldiers Exposed to Kuwaiti Oil Well Fires	C											$0
HHS-004	Suspected Increase of Birth Defects and Health Problems Among Children Born to Persian GW Veterans In Mississippi	C											$0
HHS-005	Cognitive Function and Symptom Patterns in Persian Gulf Veterans	C											$0
HHS-006	Defining Gulf War Illness	C											$0
HHS-007	Immunotoxicity of Dermal Permethrin and Cis-Urocanic Acid	C											$0
HHS-008	Strategy to Identify Non-Additive Response to Chemical Mixtures	C											$0
HHS-009	Improving Health Risk Communications to Prevent Unexplained Illnesses Related to Military Deployments	C	$339,814	$0	$0	$0	$0						$339,814
HHS-010	Health-e Voice: Optimized Implementation of a Stepped Clinical Risk Communications Guideline	C	$460,000	$0	$0	$0	$0						$460,000
HHS-011	Deployment to the Gulf War and the Subsequent Development of Cancer	C	$164,291	$0	$0	$0	$0						$164,291
HHS-012	Genetic Epidemiology of ALS in Veterans	C		$466,126	$466,481	$455,587	$441,974	$433,467	$0	$0	$0		$2,263,635
			$964,105	$466,126	$466,481	$455,587	$441,974	$433,467	$0	$0	$0	$0	$3,227,740

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Department of Veterans Affairs Gulf War Research Funding

PROJECT NO	PROJECT TITLE	STATUS	FY 2003	FY 2004	FY2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	TOTALS FY 03-12
VA-001	Mortality Follow-up Study of Persian Gulf Veterans	C											$0
VA-002	National Health Survey of Persian Gulf Veterans	C											$0
VA-002 A	VA National Survey of Persian Gulf Veterans - Phase I	C											$0
VA-002 B	VA National Survey of Persian Gulf Veterans - Phase II	C											$0
VA-002 C	VA National Survey of Persian Gulf Veterans - Phase III	C											$0
VA-003	Use of Roster of Veterans Who Served in Persian Gulf Area	C											$0
VA-004	Boston Environmental Hazards Research Center Program	C											$0
VA-004 A	Evaluation of Cognitive Functioning of Persian Gulf Veterans	C											$0
VA-004 B	Evaluation of Neurological Functioning in Persian Gulf Veterans	C											$0
VA-004 C	Gulf War And Vietnam Veterans Cancer Incidence Surveillance	C											$0
VA-004 D	Evaluation of Respiratory Dysfunction Among GW Veterans	C											$0
VA-004 E	The Aromatic Hydrocarbon Receptor (AhR) as a Biomarker of Susceptibility	C											$0
VA-004 F	Validity of Computerized Tests	C											$0
VA-005	East Orange Environmental Hazards Research Center Program	C											$0
VA-005 A	Health and Exposure Survey of Persian Gulf Veterans	C											$0
VA-005 B	Physiological and Psychological Assessments of Persian Gulf Veterans	C											$0
VA-005 C	Effects of Exertion and Chemical Stress on Persian Gulf Veterans	C											$0
VA-005 D	Effects of Genetics and Stress on Responses to Environmental Toxins	C											$0
VA-006	Core Program: Portland Environmental Hazards Research Center: Environment, Veterans Health and the Gulf War Syndrome. Core Project for Clinical and Epidemiology Research	C											$0

Department of Veterans Affairs Gulf War Research Funding

PROJECT NO	PROJECT TITLE	STATUS	FY 2003	FY 2004	FY2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	TOTALS FY 03-12
VA-006 A	Psychosocial, Neuropsychological and Neurobehavioral Assessment (Project I)	C											$0
VA-006 B	Clinical and Neuroendocrine Aspects of Fibromyalgia (Project II)	C											$0
VA-006 C	Neurotoxicity of Environmental Pollutants and Warfare Agents (Project III)	C											$0
VA-006 D	DNA Damage from Chemical Agents and Its Repair (Project IV)	C											$0
VA-006 E	Clinical and Epidemiology Leishmania Research	C											$0
VA-007	Desert Storm Reunion Survey	C											$0
VA-008	Psychological Test Data of GW Veterans Over Time	C	$0										$0
VA-009	Evaluation of Cognitive Functioning in Persian GW Veterans Reporting War-related Health Problems	C											$0
VA-010	Memory and Attention in PTSD	C											$0
VA-011	Neuropsychological Functioning in Veterans	C											$0
VA-012	Psychological Assessment of Operation Desert Storm Returnees	C											$0
VA-013	Neurobehavioral Aspects of Persian Gulf Experiences: A Pilot Study	C											$0
VA-015	Vaccine-Mediated Immunity Against Leishmaniasis	C	$59,800										$59,800
VA-016	Protective Immunity in Experimental Visceral Leishmaniasis	C											$0
VA-017	Immunological Evaluation of Persian Gulf Veterans	C											$0
VA-018	Chronic Gastrointestinal Illness in Persian Gulf Veterans	C											$0
VA-020	Psychological Adjustment in Operation Desert Shield/Storm Veterans	C											$0
VA-021	A Comparison of PTSD Symptomatology among Three Army Medical Units Involved in ODS	C											$0
VA-036	Stress Symptoms and Their Causal Attribution in Desert Storm Veterans	C											$0
VA-040	Musculoskeletal Symptoms in Gulf War Syndrome	C											$0

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Department of Veterans Affairs Gulf War Research Funding

PROJECT NO	PROJECT TITLE	STATUS	FY 2003	FY 2004	FY2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	TOTALS FY 03-12
VA-046	Diarrhea in Persian Gulf Veterans: An Irritable Bowel-Like Disorder	C											$0
VA-047	Retrospective Verification of Mustard Gas Exposure	C											$0
VA-048	Cross-Sensitization as a CNS Model for Gulf War Chemical Intolerance	C											$0
VA-049	Sensitivity to Pyridostigmine Bromide: Persistent Neural Dysfunction	C											$0
VA-050	Neuropsychological findings in a sample of Operation Desert Storm Veterans	C											$0
VA-051	Psychobiological Assessment of Desert Storm Veterans	C											$0
VA-053	Spouses and Children Program	C											$0
VA-054	Follow-up of Psychological and Neurocognitive Gulf War Outcome: Relation to Stress	C	$72,700	$39,375									$112,075
VA-055	Antibiotic Treatment of GW Veterans' Illnesses (ABT) (See also DoD-119)	C											$0
VA-056	Birmingham's GW Veterans' Illness Demonstration Clinic (13)	C											$0
VA-057	Case Management and Residential Rehabilitation for Persian GW Veterans (13)	C											$0
VA-058	Implementation and Evaluation of GW Veterans' Demonstration Project (13)	C											$0
VA-059	Demonstration Treatment Program for GW Veterans With Unexplained Physical Symptoms (13)	C											$0
VA-060	Identification and Management of Sleep Disorders in GW Veterans	C											$0
VA-061	An Epidemiological Investigation into the Occurrence of Amyotrophic Lateral Sclerosis (ALS) Among GW Veterans (See also DoD-118)	C											$0
VA-062	A Randomized, Multi-Center, Controlled Trial of Multi-Model Therapy in Veterans with Gulf War Illness (EBT) (See also DoD-115; formerly VA/DoD 1V)	C											$0

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Department of Veterans Affairs Gulf War Research Funding

PROJECT NO	PROJECT TITLE	STATUS	FY 2003	FY 2004	FY2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	TOTALS FY 03-12
VA-063	VA/DoD Core funding of the Medical Follow-Up Agency (See also DoD-116; formerly VA/DoD-2V/2D)	C	$250,000	$250,000	$250,000	$250,000	$250,000						$1,250,000
VA-063 A	Follow-Up Investigation of troops exposed to nerve agents at Aberdeen Proving Ground (Pilot Study) (See also DoD-116A; formerly VA/DoD-2VA/2DA)	C											$0
VA-063 B	Patterns of Pre-Persian Gulf War Illness and Health Care Seeking Pilot Study (See also DoD-116B; previously VA/DoD-2VB)	C											$0
VA-064	Boston Environmental Hazards Research Center	C	$297,000	$337,200	$337,200	$337,200							$1,308,600
VA-064 A	Functional Neuroimaging in Lead Exposed Adults	C											$0
VA-064 B	Quantification and Validation of Structure-Function relationships through visuospatial test performance	C											$0
VA-064 C	Development of a structured neurotoxicant assessment checklist (SNAC) for clinical use in veteran populations	C											$0
VA-065	San Antonio Environmental Hazards Research Center	C	$300,000	$337,200									$637,200
VA-065 A	Does a variant of the human SOD2 gene increase sensitivity to hazards?	C											$0
VA-065 B	The contribution of FEN-1 to genetic integrity subsequent to oxidative stress	C											$0
VA-065 C	The importance of hydrogen peroxide detoxification in cellular protection	C											$0
VA-065 D	Do defective Gpx1 and ALDH2 genes increase sensitivity to environmental hazards?	C											$0
VA-066	Physiological Responding in Posttraumatic Stress Disorder	C											$0
VA-067	Olfactory Functioning in GW Veterans	C											$0
VA-068	Family Study of Fibromyalgia	C											$0
VA-069	Cardiovascular Hyporeactivity and Fatiguing Illness in GW Veterans	C	$48,947										$48,947

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Department of Veterans Affairs Gulf War Research Funding

PROJECT NO	PROJECT TITLE	STATUS	FY 2003	FY 2004	FY2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	TOTALS FY 03-12
VA-070	A Clinical Evaluation of the Health Status of Persian GW Veterans in VISN 8	C											$0
VA-071	Central Nervous System Modulation of Visceral Pain in the Persian Gulf Syndrome	C	$47,975										$47,975
VA-072	Roles of Paraoxonase, Butyrylcholinesterase and Stress in Unexplained Illnesses	C	$50,000										$50,000
VA-073	Pain Sensitivity in GW Veterans with Medically Unexplained Musculoskeletal Pain	C	$50,000										$50,000
VA-074	A Randomized Clinical Trial for Cognitive-Behavioral Treatment for PTSD in Women (See DoD-125)	C	$1,346,863	$1,912,448									$3,259,311
VA-075	ALS and Veterans: Are Veterans at Increased Risk?	C	$139,600	$78,455									$218,055
VA-076	Analysis of Hippocampal Volume in Aging Combat Veterans with PTSD	C	$135,000	$151,740									$286,740
VA-077	HPA Axis Reactivity in Men and Women with Chronic PTSD	C	$101,300	$113,861									$215,161
VA-078	Millenium Cohort Study	C											$0
VA-080	Neurochemical and Neurobehavioral Impact of Pyridostigmine Bromide Treatment and Stress	C	$203,400	$119,818	$248,458	$253,277	$252,602						$1,077,555
VA-081	Stress, Pro-Inflammatory Cytokines and Coping Behavior	C	$193,800	$186,035									$379,835
VA-082	Pituitary Adrenal Function in People with Fatiguing Illness	C	$135,000	$151,740	$276,112	$121,842							$684,694
VA-083	Neuropsychological Assessment of a Population-Based Sample of Persian GW Veterans and Controls	C	$50,000	$31,012									$81,012
VA-084	Neurobiology of Severe Psychological Trauma in Women	C	$135,000	$151,740									$286,740
VA-085	Associative Learning in Veterans with and without Combat Experience	C	$74,000	$232,458									$306,458
VA-086	A Clinical Trial of Magnetic Stimulation in Depression	C	$131,400	$147,694									$279,094
VA-087	Improving Outcomes of Depression in Primary Care	C	$201,926	$218,280									$420,206
VA-088	Prospective Assessment of Neurocognition in Future Gulf-deployed and Gulf-nondeployed Military Personnel: A Pilot Study	C	$24,057	$47,011									$71,068

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Department of Veterans Affairs Gulf War Research Funding

PROJECT NO	PROJECT TITLE	STATUS	FY 2003	FY 2004	FY2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	TOTALS FY 03-12
VA-089	National Registry of Veterans with Amyotrophic Lateral Sclerosis	C	$319,229	$625,564	$799,104	$863,951							$2,607,848
VA-090	Differential Gene Expression in Pathologies Associated with Neuronal Hyperexcitability: Links to Gulf War Illness	O	$250,000	$281,000	$281,000	$449,990	$449,990	$0	$0	$0	$281,000	$70,250	$2,063,230
VA-090A	Neuronal Hyperexcitability and Motor Neuron Regeneration	C											$0
VA-090B	Gene Expression and Proteomic Strategies in Severe Psychiatric Disorders	C											$0
VA-090C	Developmental Differences in Alcohol Withdrawal Sensitivity	C											$0
VA-090D	Seizures and Neuroplasticity: Physiology and Biochemistry	C											$0
VA-091	The Role of Dietary Choline in Neuroprotection	C		$196,951									$196,951
VA-092	Acetylcholinesterase Activity In GW Veterans	C	$89,920	$49,833									$139,753
VA-093	HPA Axis Alterations in PTSD: A Comparison of Gulf War and Vietnam Veterans	C	$56,750	$36,080	$163,205	$127,405							$383,440
VA-094	The Immunology of Chronic Cutaneous Leishmaniasis	C		$192,204	$157,360	$202,320							$551,884
VA-095	The Role of Signal Regulatory Proteins in Astrocytomas	C	$54,158	$231,566	$238,239	$178,679							$702,642
VA-096	Functional Imaging of Pain in Veterans with Unexplained Muscle Pain	C		$49,035	$128,698	$70,302	$135,127	$95,382					$478,544
VA-097	Improving a mM-CSF Tumor Vaccine for Established Intracranial Gliomas	C	$99,563	$215,093	$241,957	$246,355	$134,628						$937,596
VA-098	Post-Transcriptional Gene Regulation of VEGF in Malignant Gliomas	C		$44,420	$168,600	$168,600							$381,620
VA-099	Vaccination Against Visceral Leishmaniasis with a multi-epitope vaccine	C	$123,413	$116,896	$118,863	$117,908							$477,080
VA-100	Studies of the Blood-Brain Barrier and its Manipulation	C	$151,875	$151,740	$151,740	$151,740							$607,095
VA-101	Biomarkers Discovery in ALS	C		$50,518	$227,130	$151,555	$112,009	$299,165	$274,432				$1,114,809
VA-102	Cholinergic and Monoaminergic Influences on Sleep	C	$92,588	$134,160	$175,814	$134,328							$536,890
VA-103	Hypothalamic and Basal Forebrain Regulation of Sleep and Arousal	C	$210,600	$296,657	$307,253	$317,845							$1,132,355

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Department of Veterans Affairs Gulf War Research Funding

PROJECT NO	PROJECT TITLE	STATUS	FY 2003	FY 2004	FY2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	TOTALS FY 03-12
VA-104	Characterization of Pain Processing Mechanisms in the Irritable Bowel Syndrome	C	$114,975	$168,600	$168,600	$84,300							$536,475
VA-105	Expression of the Major Surface Protease of Leishmania Chagasi	C	$135,628	$298,175	$119,535	$92,817							$646,155
VA-106	Interoceptive Stressor Conditioning: A Model for Gulf War Illness	C			$193,440	$198,161							$391,601
VA-107	Evaluation of Stress Response Systems in GW Veterans with CMI	C			$192,766	$117,412	$210,637	$173,321	$93,226	$0			$787,362
VA-108	Telemedicine Treatment for Veterans with Gulf War Illness	C			$185,714	$238,616	$224,916	$11,100					$660,346
VA-109	Effects of Stress on Memory: Brain Circuits, Mechanisms and Therapeutics	C			$158,372	$306,912	$317,503	$321,148	$241,520				$1,345,455
VA-110	Pain Among GW Veterans: Secondary Analysis of CSP#458 Data	C			$96,439	$48,557							$144,996
VA-111	T Cell Responses to Multiple Immunizations and Stress	C			$112,399	$112,399							$224,798
VA-112	National VA Amyotrophic Lateral Sclerosis Research Consortium	C			$1,171,208	$734,590							$1,905,798
VA-113	Novel Cause of Motor Neuron Disease	C			$166,352	$110,152	$110,152	$110,152	$0				$496,808
VA-114	Strategies in Therapeutic Development of Neurodegenerative Diseases	C			$266,950	$370,920							$637,870
VA-115	Autonomic System Changes Cause Intestinal Symptoms in GW Veterans	C			$275,623	$275,623							$551,246
VA-116	Quantitative Trait Genes Controlling Circadian and Sleep Behaviors	C			$125,888	$228,734							$354,622
VA-117	Estimates of Cancer Prevalence in Gulf Veterans Using State Registries	C			$42,206	$151,740	$115,772	$66,597	$0				$376,315
VA-118	Post War Mortality from Neurologic Diseases in Gulf Veterans, 1991-2004	C			$42,262	$160,535	$119,453						$322,250
VA-119	Patterns of Microarray Gene Expression in Gulf War Illness	C			$192,204	$168,600	$168,600						$529,404
VA-120	Arginase NO Synthase and Cell Death in Amyotrophic Lateral Sclerosis	C			$90,988	$165,116							$256,104
VA-121	Genes, Environment, and Oxidative Stress in Neurodegenerative Disorders	C			$295,938	$441,612							$737,550
VA-122	Role of Mitochondrial Oxidative Stress in ALS	C			$55,188	$271,896							$327,084
VA-123	Interactions Between Maternal Care, Stress and Pyridostigmine Bromide	C			$60,134	$48,332	$178,447						$286,913

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Department of Veterans Affairs Gulf War Research Funding

PROJECT NO	PROJECT TITLE	STATUS	FY 2003	FY 2004	FY2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	TOTALS FY 03-12
VA-124	Early Life Determinants of Vulnerability to Pyridostigmine Bromide	C			$213,110	$195,688							$408,798
VA-125	Effects of Gulf War Illness on Brain Structure, Function and Metabolism: MRI/MRS at 4 Tesla	C			$322,532	$479,892	$743,778	$653,747	$560,455	$5,135,117			$7,895,521
VA-126	Structural Magnetic Resonance Imaging in Gulf War-Era Veterans	C			$159,552	$165,565	$165,565						$490,682
VA-127	Interactions of the Leishmania sp. with Mammalian Cells	C			$101,216	$166,464							$267,680
VA-128	MR Tracking of Stem Cells for Replacement Therapy in ALS	C			$236,730	$236,730							$473,460
VA-129	Glucocorticoid Responsivity in GW Veterans	C			$168,600	$167,164	$168,600						$504,364
VA-130	Tissue Factor and Gulf War-Associated Chronic Coagulopathies	C				$194,826	$217,055	$248,741	$273,861	$158,089	$161,644		$1,254,216
VA-131	Neuroendocrine Regulators and Proteomics in GW Veterans with CMI	C				$60,767	$163,579						$224,346
VA-132	Immunologic Mechanisms and Biomarkers in Gulf War Illness	C				$64,630	$112,400	$112,400	$56,200	$56,200			$401,830
VA-133	Longitudinal Study of Gene Expression and Gene Products in Veterans with Gulf War Illness	C				$112,400	$112,400						$224,800
VA-134	Autonomic Functions of GW Veterans with Unexplained Illnesses	C				$8,880	$0	$0	$25,880	$101,863	$72,667		$209,290
VA-135	Motor Neuron Function of GW Veterans with Excessive Fatigue	C				$6,744	$0	$0	$79,242	$103,549	$25,712		$215,247
VA-136	Central Mechanisms Modulating Visceral Sensitivity	C				$83,288	$81,715	$121,055					$286,058
VA-137	Diarrhea-Predominant Irritable Bowel Syndrome in Persian Gulf Veterans	C				$161,968	$224,294	$217,325	$0	$104,982			$708,569
VA-138	Inspiratory Flow Dynamics During Sleep in GWS and the Effect of CPAP	C				$226,773	$235,240	$258,136	$9,819				$729,968
VA-139	Sleep Neurobiology and Circuitry	C				$33,720							$33,720
VA-140	Integrated Neuroimaging and Neuropathological Analysis of the Effects of Physical Activity on Progression and Therapy in ALS	C				$232,553							$232,553
VA-141	Genetic Analysis of an Invertebrate Model of Amyotrophic Lateral Sclerosis	C				$243,779							$243,779

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Department of Veterans Affairs Gulf War Research Funding

PROJECT NO	PROJECT TITLE	STATUS	FY 2003	FY 2004	FY2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	TOTALS FY 03-12
VA-142	VA Gulf War Biorepository Trust	O				$991,510	$991,510	$1,091,547	$5,664,976	$754,942	$948,168	$592,544	$11,035,197
VA-143	The Role of Protein Oxidation in the Progression of ALS	C				$112,400	$112,400						$224,800
VA-144	Testing the Role of Permethrin on the Progression of ALS	C				$112,400	$112,400						$224,800
VA-145	Proteomic Analysis of Cellular Response to Biological Warfare Agents	C				$129,260	$224,800	$224,800	$112,400	$67,752			$759,012
VA-146	Direct Delivery of Neurotoxins to the Brain by an Intranasal Route	C				$161,687	$256,159	$245,295	$195,214				$858,355
VA-147	The Diagnosis and Pathogenesis of Occult Leishmaniasis	C				$98,350							$98,350
VA-148	Profile of GW Veterans Who Applied for Undiagnosed Illness Compensation	C				$24,307	$71,008						$95,315
VA-149	Behavior of Neural Stem Cells in a Rat Model of GWS	C					$129,861	$268,901	$273,801	$136,900			$809,463
VA-150	GW Veterans Illnesses' Research IDIQ Contract with UTSW	C					$15,000,000	$15,000,000	$6,972,481	$2,288,755	$31,472		$39,292,708
VA-151	Genetic Epidemiology of ALS Veterans (CSP #500B)	C						$2,116,602	$377,557	$377,557	$242,775		$3,090,243
VA-152	Multiple Sclerosis in GW Veterans	C						$122,010	$137,791	$120,866			$380,687
VA-153	Bacterial Overgrowth Associated with Chronic Multi-Symptom Illness Complex	O							$8,377	$168,600	$94,681	$158,219	$429,877
VA-154	Imaging Pain Modulation in GW Veterans with Chronic Muscle Pain (renewal of VA-096)	O							$300,782	$258,076	$259,657	$262,184	$1,080,699
VA-155	Bacterial Host Defense Mechanisms in Polyaromatic Hydrocarbon Carcinogenesis	O				$71,486	$156,461	$176,790	$165,790	$165,790	$222,552	$168,600	$1,127,469
VA-156	Gulf War Era Cohort and Biorepository (CSP #585)	O								$28,361	$5,110	$2,157,664	$2,191,135
VA-157	A Clinical Demonstration of an EEG Brain-Computer Interface for ALS Patients (CSP #567)	O								$2,368,460	$965,519	$26,296	$3,360,275
VA-158	Testing the Feasibility of MC CBT for Veterans with IBS	C								$17,953	$93,153		$110,746
VA-159	Somatic hypersensitivity in Veterans with IBS	O							$56,200	$112,400	$112,400	$56,200	$337,200
VA-160	Lipoic Acid Therapy for Experimental Autoimmune Encephalomyelitis	O								$224,126	$168,600	$168,600	$561,326

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Department of Veterans Affairs Gulf War Research Funding

PROJECT NO	PROJECT TITLE	STATUS	FY 2003	FY 2004	FY2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	TOTALS FY 03-12
VA-161	Multiple Antigenic Peptides to Alter the Course of Autoimmune Disease	O								$332,743	$168,600	$168,600	$669,943
VA-162	Transcription factors regulating sensory gene expression and pain pathways	C							$94,416	$168,600			$263,016
VA-163	Immunoregulation of Myelin Specific T Lymphocytes	O							$371,209	$361,972	$168,600	$168,600	$1,070,381
VA-164	Central Mechanisms Modulating Visceral Sensitivity (renewal of VA-136)	O							$255,170	$267,687	$119,256	$90,574	$732,687
VA-165	A Pilot Study of CPAP Adherence Promotion by Peer Buddies with Sleep Apnea	C									$94,838		$94,838
VA-166	A Randomized Controlled Trial of a Mindfulness-Based Intervention for Gulf War Syndrome	O									$106,898	$112,394	$219,292
VA-167	Neuroprotection anf Myelin Repair Mechanisms in Multiple Sclerosis	O									$267,287	$259,707	$526,994
VA-168	Sleep Neurobiology and Circuitry	O									$244,063	$303,406	$547,469
VA-169	Prevention of Hippocampal Neurodegeneration Due to Age and Apnea	O									$202,742	$270,322	$473,064
VA-170	Epigenetic Mechanisms Relevant to the Pathogenesis of ALS	O									$182,650	$168,600	$351,250
VA-171	Nanoparticle Coupled Antioxidants for Respiratory Illness in Veterans	O									$140,500	$168,600	$309,100
VA-172	Understanding Pain of Gastrointestinal Origin in Women that Serve in OEF/OIF	O									$84,300	$168,600	$252,900
VA-173	Impact of Exercise Training on Pain and Brain Function in GW Veterans	O									$104,167	$202,910	$307,077
VA-174	GW Veterans' Illnesses Biorepository	O										$237,878	$237,878
VA-175	Memory and Mood Enhancing Therapies for Gulf War Illness	O										$266,950	$266,950
VA-176	MEG Synchronous Neural Interactions (SNI) in GW Veterans	O										$406,888	$406,888
VA-177	Somatic Hypersensitivity in Veterans with IBS (renewal of VA-159)	O										$68,970	$68,970
			$5,746,467	$7,644,559	$9,484,679	$13,013,552	$22,059,061	$21,934,214	$16,600,799	$13,856,752	$5,569,011	$6,723,556	$122,632,650

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