CDMRP
DEPARTMENT OF DEFENSE
CONGRESSIONALLY DIRECTED MEDICAL RESEARCH PROGRAMS

Toxic Exposures Research Program

Strategic Plan

INTRODUCTION

The CDMRP funds innovative and impactful biomedical research from basic science through clinical trials to transform health care for Service Members, their Families, Veterans and the American public.

The CDMRP, in collaboration with stakeholders, develops formal strategic plans. The strategic plan includes program-specific research priorities, objectives, short- and long-term goals, investment strategies and requirements for program evaluation.

This document presents the current strategy for the CDMRP's Toxic Exposures Research Program, or TERP. The TERP Strategic Plan identifies the high-impact research goals that are most important to the program and its stakeholders, and provides a framework to address those goals while remaining adaptable to changes in the medical research and clinical care environments. Congress appropriates funding for the TERP on an annual basis; therefore, there is no guarantee of future funding. The TERP reviews the strategic plan annually during vision setting, making updates as necessary.

PROGRAM BACKGROUND AND OVERVIEW

The Burden of Military-Related Toxic Exposures

The TERP defines military-related toxic exposures* as exposures to known or unknown naturally occurring, or man-made substances associated with deployed, garrison or other military-linked environments that result in adverse health effects. Service Members, their Families, Veterans and the American public may be exposed to military-related toxic exposures. These exposures or combinations of exposures can be difficult to identify and can result in poorly defined varied outcomes. Exposures may include, but are not limited to, chemicals or mixtures, weapons, metals, and air or water contaminants and pollutants.[1-5]

While the full burden and impact of military-related toxic exposures are difficult to quantify, many Service Members likely encounter toxic substances during their service, and Service Members and Veterans face diseases, conditions and symptoms that may be related to those exposures. According to a National Academies of Science, Engineering, and Medicine report, over "3.7 million U.S. Service Members have participated in operations taking place in the Southwest Asia Theater of Military Operations and in Afghanistan since 1990."[6] While there, Service Members were likely "exposed to a number of airborne hazards, including, oil-well fire smoke, emissions from open burn pits, dust and sand suspended in the air, pollution from local industries, and exhaust from diesel vehicles."[7] The Honoring our Promise to Address Comprehensive Toxics Act, or PACT Act, of 2022 expands Veteran health care and benefits and provides toxic exposure screening for Veterans through the VA.[8,9] As of April 2025, approximately 46% of those screened identified at least one potential toxic exposure.[10]

* The TERP does not consider exposures solely due to environmental extremes to be military-related toxic exposures.

Program History

In FY22, Congress established the TERP with a $30 million appropriation.

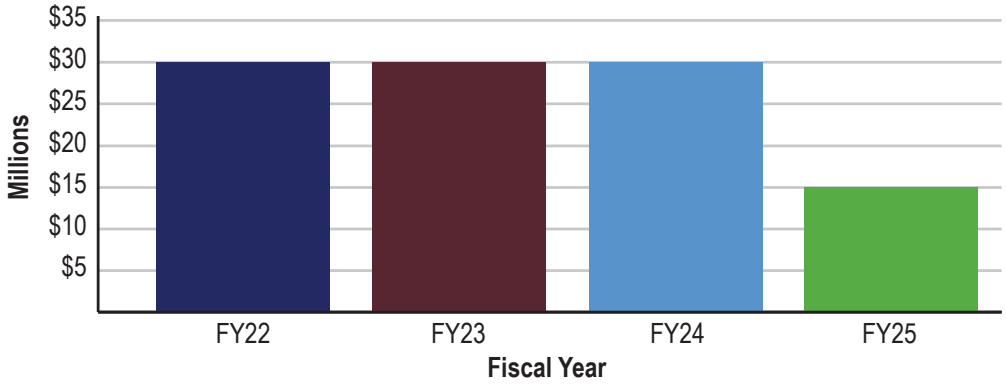
> *The agreement notes the number of known and unknown potentially harmful substances that servicemembers are exposed to as part of their military service…. Transitioning related research to a new, broader program, including neurotoxin exposure treatment research, research on Gulf War illness, exposures to burn pits, and other service-related exposures to potentially toxic chemicals and materials will allow the research community to improve scientific understanding and pathobiology from exposure, more efficiently assess comorbidities, and speed the development of treatments, cures, and preventions.*
>
> **Excerpt from the Joint Explanatory Statement as Division C, Part 2 of H.R. 2471, the Consolidated Appropriations Act, 2022.**

Based on FY22 congressional intent, the TERP supports biomedical research that provides solutions for the prevention, diagnosis, treatment, and mechanistic understanding of the adverse health outcomes associated with a broad range of military-related toxic exposures that impact the health of Service Members, their Families, Veterans and the American public. Consistent with the program's congressional language, the TERP supports research focused on four main topic areas:

- Neurotoxin* Exposure
- Gulf War** Illness (GWI)*** and Its Treatment
- Airborne Hazards and Burn Pits
- Other Military Service-Related Toxic Exposures in General, Including Prophylactic Medications, Pesticides, Organophosphates, Toxic Industrial Chemicals, Materials, Metals, and Minerals

Prior to FY22, multiple CDMRP programs supported research to provide health care solutions for diseases and conditions linked to military-related toxic exposures. In FY22, Congress realigned and consolidated these efforts under the TERP but did not prohibit other CDMRP programs from funding related research.

Figure 1. TERP Appropriations



From FY22 to FY25, Congress appropriated $105M for the TERP

* **Neurotoxin:** Synthetic or natural substances that damage, destroy, or impair the functioning of the nervous system

** **Gulf War:** The 1990-1991 Persian Gulf War

*** The TERP uses both the U.S. Centers for Disease Control and Prevention and "Kansas" definitions of GWI as related to the 1990-1991 Persian Gulf War, as recommended by a *National Academy of Medicine Report*.[11]

VISION AND MISSION

Vision: Prevent, minimize and mitigate the impact of military-related toxic exposures and improve the health and quality of life of those affected

Mission: Support impactful research aimed at identifying the cause and understanding the health outcomes, comorbidities and pathological mechanisms associated with military-related toxic exposures to facilitate the prevention, diagnosis and treatment of the visible and invisible diseases and symptoms impacting Service Members, their Families, Veterans and the American public

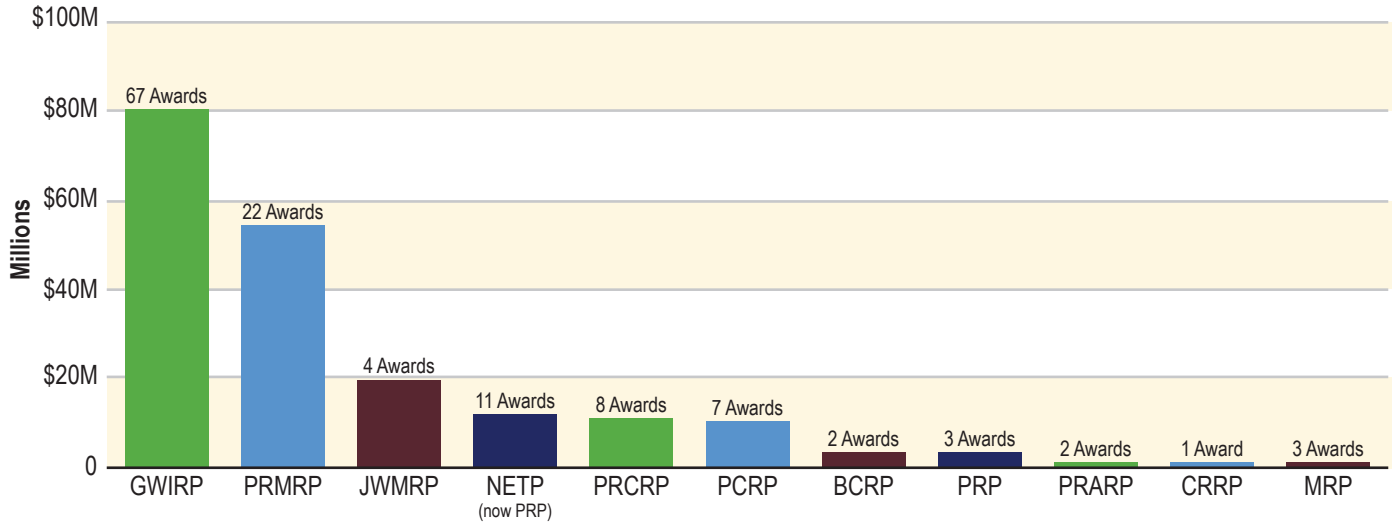
RESEARCH FUNDING LANDSCAPE

Given the breadth of the TERP, the expansive list of military-related toxic exposures and combinations of exposures, and the range of diseases, conditions and symptoms that could arise as a result of these exposures, the TERP funding landscape has touchpoints across many different programs and institutions. The following is a high-level overview of some of the agencies and programs that align with the program's congressional intent and is by no means all encompassing.

TERP-RELEVANT CDMRP INVESTMENTS

The data below depict the funding invested by the CDMRP for research related to toxic exposures, including awards open as of January 2025. The data include an analysis of TERP-relevant open awards from select programs and does not necessarily represent the full scope of all CDMRP investments that may be related to the TERP.

Figure 2. TERP-Relevant CDMRP Investments



The analysis includes the former Gulf War Illness Research Program, GWIRP; the Peer Reviewed Medical Research Program, PRMRP, the Joint Warfighter Medical Research Program, JWMRP; the Parkinson's Research Program, PRP, formerly, the Neurotoxin Exposure Treatment Parkinson's Research Program, NETP; the Peer Reviewed Cancer Research Program, PRCRP; the Prostate Cancer Research Program, PCRP; the Breast Cancer Research Program, BCRP; the Peer Reviewed Alzheimer's Research Program, PRARP; the Combat Readiness-Medical Research Program, CRRP; and the Melanoma Research Program, MRP.

The graph shows investments represented in millions of dollars and indicates the number of active awards on each program bar. The data included is the landscape as of January 2025. Not an official estimate.

Other Federal Funding

The data in Table 1 describe the investments of other federal funding agencies between FY18 and FY22 in research areas associated with military-related toxic exposures. The TERP used a list of search terms related to the four TERP topic areas to obtain funding data through the NIH RePORTER and VA websites. Other major federal funding agencies that support research in areas related to military-related toxic exposures include the NIH, including but not limited to the National Institute

of Environmental Health Sciences, National Institute of Allergy and Infectious Diseases, National Cancer Institute, and the National Heart, Lung and Blood Institute; the VA; the Centers for Disease Control and Prevention, CDC; the Agency for Toxic Substances and Disease Registry, ATSDR; the U.S. Food and Drug Administration, FDA; and the Agency for Healthcare Research and Quality, AHRQ.

The TERP recognizes the wide range of topics encompassed by this broad program and understands this funding landscape may not capture all the TERP-relevant funding by these federal agencies, or all agencies, that conduct research in the field of toxic exposures.

Table 1. Toxic Exposure Research Funding by Federal Agency, FY18-FY22

Organization	Funding ($M)
NIH	$14,838.78
VA	$262.14
CDC	$37.74
ATSDR	$22.29
FDA	$2.61
AHRQ	$1.49

Not an official estimate.

Non-Federal Funding Agencies

Multiple disease-, condition-, and symptom-specific nonfederal organizations exist that specialize in supporting the clinical needs of patients and families, and some invest in research areas relevant to the TERP's mission. Because of the breadth of adverse health outcomes that may arise from military-related toxic exposures, the TERP shares common interests with many different nonfederal funding organizations.

STRATEGIC DIRECTION

Congressional Language

The TERP's primary direction comes from the congressional language that accompanies the TERP's appropriations.

Coordination Efforts

The TERP coordinates with several other agencies, funding organizations, and federal committees to provide awareness across relevant program activities and priorities. The coordination efforts include, but are not limited to, the Defense Health Agency Environmental Exposures research portfolio; the Joint Program Executive Office for Chemical, Biological, Radiological and Nuclear Defense; the VA Office of Research and Development; the VA Health Outcomes of Military Exposures office; the NIH; the VA Research Advisory Committee on Gulf War Veterans' Illnesses; the Tri-Service Toxicology Consortium; and the Toxic Exposure Research Working Group.

Request for Information and Stakeholders Meeting

Prior to the TERP's inaugural vision setting meeting, the CDMRP released a request for information, RFI, to the broader stakeholder community. The RFI asked respondents to provide input on knowledge gaps, outcomes and product needs in military service-related toxic exposures research and indicate whether they were interested in participating in the TERP's stakeholders meeting. The TERP received over 250 RFI responses. Program staff compiled these data with pre-meeting data collected from stakeholders meeting participants to initiate and inform discussions at the TERP stakeholders meeting.

The TERP stakeholders meeting brought together a group of nearly 80 scientific, clinical, and military subject matter experts, consumers,* and patient advocates. Together, stakeholders developed a list of the top five research gaps for each of the four TERP topic areas, and identified ways the TERP could address these gaps. The stakeholders book, RFI data, and outcomes of the stakeholders meeting are available on the *TERP website*.

The information from the RFI and stakeholders meeting continues to guide and inform the program in all aspects of the program cycle, such as vision setting.

Annual Vision Setting

Each year during vision setting, members of the TERP Programmatic Panel, listed on the *TERP website*, review and recommend the program's priorities and investment strategy. The panel considers the program's congressional language and intent, community needs, stakeholder priorities and the research landscape to recommend a plan for that fiscal year's appropriation. Notably, including consumers on the programmatic panel provides the other panel members and program staff an opportunity to hear firsthand knowledge and experiences from the communities that the TERP aims to serve. These perspectives help guide the TERP and keep consumer needs at the forefront of the program's focus.

* The TERP defines a consumer as a person living with a disease, injury, or condition or a family member or caregiver of a person impacted by a disease/injury/condition associated with military-related toxic exposures.

Major Gaps and Strategic Priorities

Based on the TERP's congressional language and intent, the current state of the science, and the input received from stakeholders and consumers during the inaugural stakeholders meeting, the TERP recognizes the following major gaps in the field of military-related toxic exposures:

- The critical need to rapidly identify and diagnose the adverse health outcomes associated with military-related toxic exposures
- The challenges associated with limited and/or delayed treatments for the health outcomes associated with military-related toxic exposures
- The difficulty in assessing an individual's exposure(s) and the potential risks/health outcomes associated with that exposure(s)
- The need to prevent the next generation from being exposed to toxic substances

As a result of these major gaps, and in accordance with the TERP's congressional intent, mission, vision, and consumer needs, the TERP's strategic priorities are to:

- Support health care solutions for Service Members, their Families, Veterans and the American public impacted by military-related toxic exposures
- Invest in strategies to prevent the next generation of Service Members, their Families, Veterans and the American public from being exposed to military-related toxic exposures
- Encourage collaborations between military and VA researchers/organizations and non-military/non-VA organizations to maximize access to resources and infrastructure

Program Goals

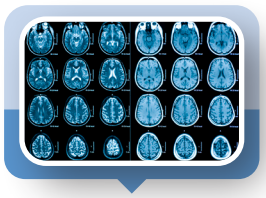
To work towards closing these gaps and addressing the strategic priorities, the TERP established five equally important, long-term program goals that are applicable to the four TERP topic areas, as shown in Figure 3. The program goals reflect the program's congressional language, the gaps and input identified by participants in the RFI and stakeholders meeting, the current state of the science, and the research landscape.

1. **Predict and prevent military-related toxic exposures** by identifying strategies that can anticipate, identify, monitor and prevent Service Members and the American public from adverse effects of exposures to toxic substances.
2. **Elucidate mechanisms of how military-related toxic exposures result in adverse effects**, including but not limited to toxicities, malignancies, neurologic and respiratory disorders, cardiac complications, sleep disorders, immune system dysfunction, gastrointestinal issues, etc.
3. **Diagnose the effects of military-related toxic exposures**, understand the phenotypic, pathological and clinical outcomes associated with short-term and long-term exposures, and predict disease progression.
4. **Develop therapeutics, treatments and strategies** to minimize symptoms and disease progression association with military-related toxic exposures.
5. **Understand the multigenerational effects of military-related toxic exposures** and how they impact those exposed, their partners, and their descendants.

Topic Areas

The TERP's topic areas are of equal importance:

Figure 3: Topic Areas



Neurotoxin Exposure

Gulf War Illness and Its Treatment

Airborne Hazards and Burn Pits

Other Military Service-Related Toxic Exposures in General, Including Prophylactic Medications, Pesticides, Organophosphates, Toxic Industrial Chemicals, Materials, Metals and Minerals

Program Guidance

The TERP focuses its efforts and investments in high priority areas that align with the program's mission and intent and demonstrate high potential impact to the communities the program aims to serve.

Starting in FY24, the TERP informed the research community that the following areas **do NOT** meet the program's intent:

- Research data that are classified and/or research in which the anticipated outcomes may be classified or deemed sensitive to national security concerns
- Chemical warfare agents categorized as fourth-generation agents or non-traditional agents
- *Biological Select Agents or Toxins*
- Anomalous Health Incidents, commonly referred to as Havana Syndrome
- Directed energy weapons
- Development of medical countermeasures or devices intended to diagnose, detect, prevent or treat the immediate (point of injury) health effects of chemical weapons, biological, radiological or nuclear threats
- Treatments or therapeutics for the immediate, adverse health effects of any exposure that would be administered in an acute care setting, i.e., role of care (ROC) 1 or ROC 2.
  - In the military health echelon/ROC, this generally refers to ROC 1 and ROC 2 described below:
    - ROC 1: Unit-level medical care, ranging from point of injury through battalion aid station
    - ROC 2: Advanced trauma management and emergency medical treatment
    - For more information on the military roles of care, refer to *Chapter 2, "Roles of Medical Care (United States)," Emergency War Surgery, Fifth United States Edition, 2018, Borden Institute*.[12]

The TERP also informed the research community that the following ARE permitted under the TERP. These research areas are not prioritized over any others within the scope of the TERP's program goals and topic areas.

- Evaluation/treatment of long-term or chronic health impacts of traditional chemical weapons, including but not limited to the long-term effects of sublethal doses of sarin, soman, and sulfur mustard, and Gulf War illness.
- Other long-term/chronic effects of military-related exposures that would be diagnosed or treated at a ROC 3 (field hospital) or ROC 4 (definitive care; fixed medical treatment facility) or beyond.

INVESTMENT STRATEGY

To work toward closing the major gaps and addressing the strategic priorities and program goals across topic areas, the TERP invests in impactful research and development at various stages of maturity, including basic laboratory research, translational research, clinical research and clinical trials.

Figure 4. TERP Award Mechanisms Along the Research Continuum

From FY22 to FY25, the TERP offered award mechanisms spanning the research continuum, including the Investigator Initiated Research Award from FY22 to FY25; the Translational Research Award from FY22 to FY24 or the Translational Research Partnership Award in FY25; and the Clinical Trial Award from FY22 to FY24 or the Clinical Trial Partnership Award in FY25. Given the different levels of scientific maturity for research areas within the program goals and across topic areas, the program aims to provide applicants with an opportunity to advance existing ideas towards clinical practice as well as bring new, well-developed hypotheses forward.

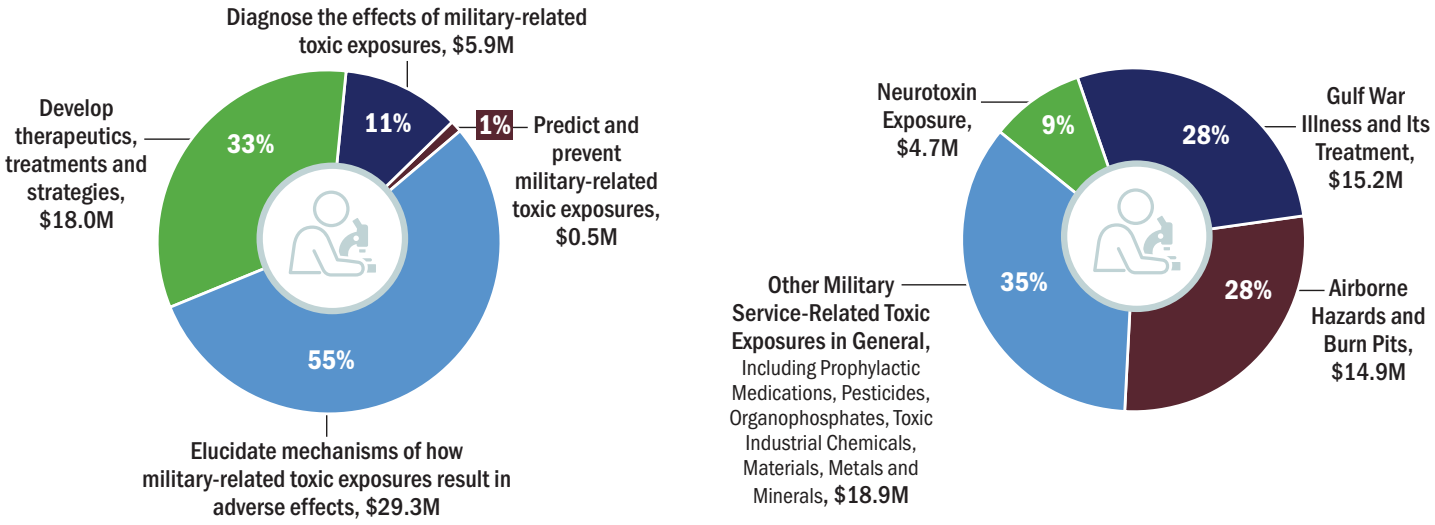
The TERP encourages productive collaborations to tackle difficult questions and find solutions for military-related toxic exposures. Therefore, from FY22 to FY24, the Translational Research Award and Clinical Trial Award offered a Partnering Principal Investigator Option and in FY25 the Translational Research Partnership Award and Clinical Trial Partnership Award required partnership. In line with congressional language, the TERP encourages collaboration with DOD and VA researchers and clinicians to leverage access to resources and infrastructure. The TERP also encourages researchers to engage with consumer communities to understand their needs and perspectives. From FY22 to FY25, the TERP's translational research and clinical trial mechanisms encouraged applicants to include consumers on the research team where they could contribute to the development of the research question, project design, oversight, and evaluation.

The TERP reviews the program's investment strategy each year at the vision setting meeting where the programmatic panel recommends award mechanisms that will support the program's goals and topic areas, align with congressional intent, are appropriate for the current state of the science, and importantly, will advance health care solutions that meet the needs of the consumer community.

MEASURING PROGRESS

Between FY22 and FY23, the TERP supported 43 projects representing 58 awards* across the four program goals and four topic areas, as shown in Figure 5. The TERP portfolio spans an array of exposures, diseases, symptoms and conditions, as shown in Figure 6.

Figure 5. Investment by Program Goal and Topic Area, FY22-FY23**



Percentages calculated based on total investment by program goal, left, and topic area, right. Awards categorized by primary program goal and topic area; many awards address multiple program goals and topic areas.

Figure 6: Research Portfolio Highlights, FY22-FY23

Exposures	Health Outcomes
• Per- and Polyfluoroalkyl Substances • Particulate Matter • Malaria Prophylactic Medication • Sulfur Dioxides Combined with Cigarette Smoke • Hexavalent Chromium • Pyridostigmine Bromide and Organophosphates • Beryllium • Trichloroethylene • Cadmium • Jet Fuel • Burn Pits • Pesticides • Benzene • Exhausts	• Gulf War Illness • Testicular Cancer • Deployment-Related Respiratory Disease & Other Respiratory Conditions/Diseases • Prostate Cancer • Ovarian Function • Parkinson's Disease • Alzheimer's Disease • Neurodegeneration & Cognitive Dysfunction • Liver Disease • Reproductive & Developmental Impacts • Amyotrophic Lateral Sclerosis • Lung Cancer • Cardiac Outcomes • Immunotoxicity • Acute Myeloid Leukemia

Examples of TERP-funded exposures and health outcomes. All efforts are currently ongoing, and outcomes are pending.

* The FY22 and FY23 Translational Research and Clinical Trial Awards offered a Partnering Principal Investigator Option.

** As of July 2025, FY24 awards are under negotiation and not reported in Figure 5. In FY25, the TERP added a *program goal* not represented here, as this figure reports only FY22 and FY23 investments.

Pending receipt of congressional appropriations, the TERP plans to continue to support research across a broad range of military-related toxic exposures and the numerous complex, visible and invisible adverse health outcomes that affect those who have been or could potentially be exposed. As indicated in the TERP funding opportunities offered between FY22 and FY25, portfolio balance is an important programmatic review criterion. Each year, the programmatic panel members review portfolio balance before making funding recommendations.

In addition to maintaining a broad portfolio that meets congressional intent, accelerates the research pipeline across the program goals and topic areas, and addresses stakeholder needs, the program does and will continue to evaluate return on investment in the near- and mid- to long-term using the metrics below.

Near-Term: The TERP annually monitors application receipt and evaluates the number of high-quality applications received. The TERP also assesses whether the program is facilitating collaborative awards, particularly those that include DOD and/or VA researchers and clinicians. The program will measure near-term program success and progression toward program goals by monitoring outcomes such as publications, presentations, press releases, patents, and applications to the FDA or other regulatory agencies.

Mid- to Long-Term: In addition to annually assessing these near-term metrics, the TERP will also measure the success of the program in the mid- to long-term. The TERP intends for mechanistic and basic research studies supported by the program to advance toward translational and clinical efforts. The TERP anticipates that awards focused on developing diagnostic tools, therapeutics/treatments and/or prevention strategies will mature and advance the science forward toward clinical trials, clinical practice and/or implementation. The TERP will track this progress by monitoring research dissemination and implementation, follow-on funding and advanced development, knowledge and technology readiness levels,* and/or clinical use. These metrics will allow the TERP to evaluate return on investment.

REFERENCES

1. "Military Exposures," U.S. Department of Veterans Affairs, last modified July 14, 2025, https://www.publichealth.va.gov/exposures/index.asp.
2. "Occupational Hazards," U.S. Department of Veterans Affairs, last modified April 30, 2025, https://www.publichealth.va.gov/exposures/categories/occupational-hazards.asp.
3. "Garrison exposures and health concerns," U.S. Department of Veterans Affairs, last modified April 27, 2020, https://www.publichealth.va.gov/exposures/publications/military-exposures/meyh-2/garrison.asp.
4. "Red Hill Fuel Release Public Health Information," Defense Health Agency, last modified June 26, 2025, https://ph.health.mil/topics/campaigns/red-hill-public-health/Pages/default.aspx.
5. "Camp Lejeune, North Carolina," Agency for Toxic Substances and Disease Registry, accessed July 14, 2025, https://www.atsdr.cdc.gov/camp-lejeune/?CDC_AAref_Val=https://www.atsdr.cdc.gov/sites/lejeune/index.html.
6. National Academies of Sciences, Engineering, and Medicine, *Respiratory Health Effects of Airborne Hazards Exposures in the Southwest Asia Theater of Military Operations* (The National Academies Press, 2020), https://doi.org/10.17226/25837.
7. National Academies of Sciences, Engineering, and Medicine, "Respiratory Health Effects of Airborne Hazards Exposures in the Southwest Asia Theater of Military Operations," *Consensus Study Report Highlights*, no. 9 (2020): 1-4, https://nap.nationalacademies.org/resource/25837/Gulf%20Respiratory%20Health_Highlights_PDF.pdf.
8. "Text - S.3373 - 117th Congress (2021-2022): Honoring our PACT Act of 2022," Congress.gov, August 10, 2022, https://www.congress.gov/bill/117th-congress/senate-bill/3373/text.
9. "The PACT Act and your VA benefits," U.S. Department of Veterans Affairs, last modified April 21, 2025, https://www.va.gov/resources/the-pact-act-and-your-va-benefits/.
10. U.S. Department of Veterans Affairs, *VA PACT Act Performance Dashboard*, no. 48 (April 2025), https://department.va.gov/pactdata/wp-content/uploads/sites/18/2025/04/VA-PACT-Act-Dashboard-Issue-48_041825-508.pdf.
11. Committee on the Development of a Consensus Case Definition for *Chronic Multisymptom Illness in 1990-1991 Gulf War Veterans, Board on the Health of Select Populations, Institute of Medicine, Chronic Multisymptom Illness in Gulf War Veterans: Case Definitions Reexamined* (The National Academies Press, 2014), https://www.ncbi.nlm.nih.gov/books/NBK268875/pdf/Bookshelf_NBK268875.pdf
12. Borden Institute, "Roles of Medical Care (United States)," in *Emergency War Surgery, Fifth United States Revision*, ed. Miguel A. Cubano (Office of The Surgeon General, 2018), 9-22, https://medcoeckapwstorprd01.blob.core.usgovcloudapi.net/pfw-images/dbimages/Ch%202.pdf.

* KRLs and TRLs measure knowledge or technology maturity, respectively.