

NIH Chemical Countermeasures Research Program

Background

The NIH Chemical Countermeasures Research Program ([CCRP](#)) is a component of the broader civilian biodefense research effort within the HHS, NIH, and NIAID. The overarching goal of the CCRP is to integrate cutting edge research with the latest technological advances in science and medicine to enhance the national medical and public health preparedness for, response to, and recovery from disasters and public health chemical emergencies. Many Department of Homeland Security (DHS) identified Chemicals of Concern (CoC) are not only potential agents of terrorism, but also may be released from transportation and storage facilities during industrial accidents or natural disasters.

The CCRP is a collaborative network of academic, industry, and federal laboratories. It leverages the expertise of multiple NIH Institutes and Centers to manage discovery research and early development of medical countermeasures (MCMs) that could be used to prevent lethality and/or treat injuries resulting from toxic chemical exposure. The CCRP supports a trans-NIH research infrastructure comprised of contracts, inter-agency agreements with the DoD and HHS in addition to extramural programs in basic and translational “CounterACT” research projects. The CCRP includes the participation of the National Institute of Environmental Health Science (NIEHS), National Eye Institute (NEI), National on Drug Abuse (NIDA), National Institute of Neurological Disorders and Stroke (NINDS), National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS), Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD), National Heart, Lung, and Blood Institute (NHLBI), and the National Center for Advancing Translational Sciences (NCATS).

In addition to preclinical research support resources, the CCRP offers research funding via interagency agreements, Parent Announcements (For Un-solicited or Investigator-Initiated Applications) and targeted solicitations for Research Project Grant (R01), Phased Cooperative Agreements (UG3/UH3), Exploratory Developmental Translational (R21), Planning Grant Program (R34), and Small Business Innovation Research and Technology Transfer (SBIR/STTR) programs.

Chemicals of Concern

The civilian chemical threat spectrum includes chemical warfare agents, toxic industrial chemicals and materials, and many others. These compounds have been identified as public health CoCs by the DHS and can have a variety of toxic effects or toxidrome(s).

The toxidromic classes of chemicals of concern include -

- Cholinergic, convulsant, encephalopathic, and sympathomimetic/stimulant agents that target the nervous system inducing seizure and and/or neurodegeneration
- Cellular respiration inhibitors, such as blood (cyano agents & Krebs cycle poisons), hemolytic, and metabolic (heavy and non- metals) agents
- Pulmonary, irritant, and corrosive agents that target the respiratory tract and may induce edema and/or other long-term pathologies
- Vesicating agents that may cause dermal and ocular pathologies
- Pharmaceutical-based agents, such as incapacitating compounds and respiratory depressants
- Other agents such as those that induce coagulopathy

Research Priority Areas

The CCRP research priority areas include but are not limited to -

- Fundamental research identifying molecular mechanisms of acute toxicity, biological markers of exposure, demonstrate target engagement(s) and appropriate biological activity of candidate therapeutics to mitigate the post-exposure effects of the threat agent
- Applied research developing screening assays to identify candidate MCM compounds and animal models of the natural history of the ‘disease’ to characterize/optimize *in vivo* therapeutic efficacy

What We Offer — Funding Opportunities

Investigators are encouraged to contact CCRP staff for information about available NIH funding opportunities in chemical defense and countermeasures discovery research and early development. These opportunities are typically available throughout the year.



Active CCRP Notices of Funding Opportunities include:

- [RFA-DA-26-034](#): Basic Research on The Deleterious Effects of Acute Exposure to Ultra-Potent Synthetic (UPS) Opioids (R01 Clinical Trial Not Allowed)
- [PA-25-093](#): Limited Competition: Promoting a Basic Understanding of Chemical Threats to Skin (R34 Clinical Trial Not Allowed)
- [PAR-25-296](#): Limited Competition: Clinical and Translational Science Award (CTSA) Program: Collaborative and Innovative Acceleration Award (UG3/UH3 Clinical Trial Optional)
- [PAR-25-077](#): Countermeasures Against Chemical Threats Basic Research on Chemical Threats that Affect the Nervous System (R01 Clinical Trial Not Allowed)
- [PAR-23-065](#): NIAID Resource-Related Research Projects (R24 Clinical Trial Not Allowed)
- [PAR-22-225](#): NIAID Investigator Initiated Program Project Applications (P01 Clinical Trial Not Allowed)
- [PA-25-304](#): NIH Exploratory/Developmental Research Project Grant (Parent R21 Clinical Trial Not Allowed)
- [PA-25-301](#): NIH Research Project Grant (Parent R01 Clinical Trial Not Allowed)
- [PA-24-247/PA-24-245](#): PHS 2024-2 Omnibus Solicitation of the NIH, CDC, and FDA for SBIR and STTR Grant Applications

NIH staff also can provide advice on opportunities available from other U.S. government agencies and departments, such as HHS Biomedical Advanced Research & Development Authority (BARDA), FDA Medical Countermeasures Initiative (MCMi), and the DoD's Defense Threat Reduction Agency.

What We Offer — Product Development Support Services (PDSS)

The CCRP can provide the following no-cost support services to investigators whose products show promising results as potential MCMs in preliminary testing:

- **Pre-Clinical Efficacy Evaluation Resources (PEER)**
 - Development of novel and/or refinement of chemical intoxication models
 - Limited exploratory efficacy evaluation in established small laboratory animal models:
 - Sulfur Mustard(SM) Pulmonary Toxicity
 - SM Hematological Toxicity
 - SM Ocular Toxicity
 - Soman (GD) Neurotoxicity
- **Pre-Clinical Development Resources (PDR)**
 - Initial non-Good Laboratory Practice (GLP)/Good Manufacturing Practice (GMP) Absorption, Distribution, Metabolism, Excretion (ADME), and Toxicity (ADME-Tox) Services
 - Chemistry and Manufacturing Services (CMC)
 - Development/Review of pre-clinical and/or Product Development Plans

The chief purpose of these support services is to assist applicants in obtaining important preclinical proof-of-principle efficacy and/or early development data in support of subsequent research applications.

What We Offer – Guidance to Academic, Commercial, and Government Investigators

NIAID encourages all investigators to contact CCRP program staff for advice and guidance on how to advance potential models and therapies from the initial idea through the basic research and discovery stages and forward into the early phases of product development.

Who To Contact

Based on the research topic of interest, CCRP staff can facilitate discussions with the appropriate program official(s) as well as other U.S. government organizations, e.g., BARDA, FDA, and DoD, that have an interest in emergency preparedness and MCM research and development.

To learn more, contact niaidccrp@mail.nih.gov

Also see: **The National Institutes of Health Chemical Countermeasures Research Program (NIH CCRP): A Collaborative Opportunity to Develop Effective and Accessible Chemical Medical Countermeasures for the American People.** *Drug Dev Res.* 81 (8): 907-10. DOI: [10.1002/ddr.21707](https://doi.org/10.1002/ddr.21707)

Additional Information

NIH Chemical Countermeasures Research Program (CCRP) - <https://www.niaid.nih.gov/research/chemical-countermeasures-program>

- **NINDS** - <https://www.ninds.nih.gov/current-research/trans-agency-activities/counteract-program>
- **NIEHS** - <https://www.niehs.nih.gov/research/supported/centers/counteract/>
- **NEI** - <https://www.nei.nih.gov/grants-and-training/funding-opportunities/programs-and-research-priorities/counteract-ocular-therapeutics-program>
- **NIAMS** - <https://www.niams.nih.gov/grants-funding/funded-research/promoting-basic-understanding-chemical-threats>

Center for the Biomedical Advanced Research and Development Authority (BARDA) - <https://aspr.hhs.gov/AboutASPR/ProgramOffices/BARDA/Pages/default.aspx>

HHS Public Health Emergency Medical Countermeasures Enterprise (PHEMCE)
<http://www.phe.gov/preparedness/mcm/phecme>

NIAID





National Institutes
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CCRP-Supported Project Portfolio

Project Identifier (NIH RePORTER Description)	Project Title	Contact PI/Project Leader	Awardee Organization	Toxidrome (DHS Chemicals of Concern)
R34 AR081456	The Role of Macrophages in Vesicant Skin Injury and Repair	KOH, TIMOTHY J	UNIVERSITY OF ILLINOIS AT CHICAGO	Vesicant Dermal (Nitrogen Mustard & Phenylarsine Oxide)
R34 AR082554	Oxidized Lipids and Microvesicle Particles as Effectors for Chemical Threats to Skin	TRAVERS, JEFFREY B	WRIGHT STATE UNIVERSITY	Vesicant Dermal (Nitrogen Mustard & Arsenical)
R34 AR083572	Explant Human Skin Perfusion Model to Study Mechanisms of Chemical Injury and Mitigation	EJAZ, ASIM	UNIVERSITY OF PITTSBURGH AT PITTSBURGH	Vesicant Dermal (Nitrogen Mustard & Phenylarsine Oxide)
R34 AR084669	Integrated Spatial Omics to Elucidate Conserved Inflammatory Mechanisms of Vesicant-Induced Skin Injury	PRIDEAUX, BRENDAN (contact) FINNERTY, CELESTE CAMPBELL	UNIVERSITY OF TEXAS MED BR GALVESTON	Vesicant Dermal (Sulfur Mustard & Lewisite)
R34 AR084090*	Coordinated Cytoskeletal and Cell Adhesion Dynamics in Vesicant Induced Skin Injury	WU, XIAOYANG	UNIVERSITY OF CHICAGO	Vesicant Dermal (Nitrogen Mustard & Phenylarsine Oxide)
R56 AR085100*	Skin Cell Heterogeneity in Sensitivity to Mustard-Induced Cell Death	ANDERSEN, BOGI	UNIVERSITY OF CALIFORNIA, IRVINE	Vesicant Dermal (Sulfur Mustard)
UG3 AR083022	Development of Small Molecule Inhibitors as Anti-Inflammatory Agents and Antidotes for Arsenicals	AUGELLI-SZAFRAN, CORINNE ELIZABETH	SOUTHERN RESEARCH INSTITUTE	Vesicant Dermal (Lewisite & Phenylarsine Oxide)
UG3 AR084667	Synthetic Melanin for Accelerating Wound Repair	LU, KURT (contact) GIANNESCHI, NATHAN CLAUDE	NORTHWESTERN UNIVERSITY AT CHICAGO	Vesicant Dermal (Nitrogen Mustard & Sulfur Mustard)
IAA (AOD25009-001)	High Throughput Screen Model Development and Screening of the Human Druggable Genome for Acrolein Ocular Injury	RUFF, ALBERT	U.S. ARMY MEDICAL RESEARCH INSTITUTE OF CHEMICAL DEFENSE	Vesicant Ocular (Acrolein)
IAA (AOD25009-001)	Evaluation Of Validated Targets in Mouse Models of Toxicant Ocular Injury	WILLIAMS, PATRICK	U.S. ARMY MEDICAL RESEARCH	Vesicant Ocular (Chloropicrin & Sulfur Mustard)

Denotes *FY25 NEW START award

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			INSTITUTE OF CHEMICAL DEFENSE	
IAA (AOD25009-001)*	A Recurrent Neural Network Approach to Predict Target Discovery: Modeling of Gene Expression and Pathway Dynamics in Chemical-Induced Corneal Injury	DINH, THANH CONG	U.S. ARMY MEDICAL RESEARCH INSTITUTE OF CHEMICAL DEFENSE	Vesicant Ocular (Chloropicrin, Hydrogen Fluoride & Sulfur Mustard)
R21 EY035974	DSP Nanoparticles for Treating Nitrogen Mustard Induced Corneal Injury	XU, QINGGUO	VIRGINIA COMMONWEALTH UNIVERSITY	Vesicant Ocular (Nitrogen Mustard)
R21 EY035976	Targeting Corneal Schwann Cells to Counteract Against Toxin Injury	MOHAN, ROYCE	UNIVERSITY OF CONNECTICUT SCH OF MED/DNT	Vesicant Ocular (Nitrogen Mustard)
R21 EY035970*	Cytoprotective and Pro-regenerative Neuropeptide as Countermeasure to Mustard Gas Ocular Damage	CHEN, YIHE	SCHEPENS EYE RESEARCH INSTITUTE	Vesicant Ocular (Nitrogen Mustard)
R01 EY034140	Understanding Mustard Vesicants Distribution and Toxicity in The Eye Using In Vivo And in Silico Models	TEWARI-SINGH, NEERA	MICHIGAN STATE UNIVERSITY	Vesicant Ocular (Nitrogen Mustard & Sulfur Mustard)
R01 EY035220	Mitochondria and Mustard Damage at The Ocular Surface	FINI, M. ELIZABETH	TUFTS MEDICAL CENTER	Vesicant Ocular (Nitrogen Mustard)
R01 EY035222	Soluble Epoxide Hydrolase and Epoxide Fatty Acid Involvement in Corneal Injury After Ammonia Exposure: Mechanisms of Injury and Potential Therapeutics Using SEH Inhibitors and Biostable Epfa Mimics	WATSKY, MITCHELL A	AUGUSTA UNIVERSITY	Vesicant Ocular (Ammonia)
R01 EY035221	Pathophysiology of Chronic and Delayed Mustard Gas Keratopathy	DJALILIAN, ALI R	UNIVERSITY OF ILLINOIS AT CHICAGO	Vesicant Ocular (Nitrogen Mustard)
R01 EY035215	Immune Mechanisms of Chronic Ocular Damage after Acute Exposure to Nitrogen Mustard	CHEN, YIHE	SCHEPENS EYE RESEARCH INSTITUTE	Vesicant Ocular (Nitrogen Mustard)
R01 EY037664*	Corneal and Schwann Cell Mechanisms in Vesicant Injury	MOHAN, ROYCE	UNIVERSITY OF CONNECTICUT SCH OF MED/DNT	Vesicant Ocular (Nitrogen Mustard)

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R01 EY037745*	The Role of Sirt6 in Acrolein-Induced Ocular Injury	LIU, HUA (contact) MOTAMEDI, MASSOUD	UNIVERSITY OF TEXAS MEDICAL BR	Vesicant Ocular (Acrolein)
U01 EY032973	First Aid Medicine to Treat Vesicant Induced Corneal Injury	CHANDLER, HEATHER	OHIO STATE UNIVERSITY	Vesicant Ocular (Nitrogen Mustard & Sulfur Mustard)
UG3 EY036558*	Fenofibrate Microemulsion for Treating Nitrogen Mustard Induced Corneal Injury	XU, QINGGUO (contact) MA, JIAN-XING	VIRGINIA COMMONWEALTH UNIVERSITY	Vesicant Ocular (Nitrogen Mustard)
U2C EY036984	Wake Forest University Vesicant Exposure Resource and Coordination Core	MCNUTT, PATRICK MICHAEL	WAKE FOREST UNIVERSITY HEALTH SCIENCES	Vesicant Ocular, Dermal, & Pulmonary (Sulfur Mustard, Toxic Industrial Materials & Related Chemicals)
IAA (AOD25007-001)	Evaluation Of Therapeutics for Sulfur Mustard-Induced Pulmonary Fibrosis and Bronchiolitis Obliterans	ZIMMERMAN, DANIELLE	U.S. ARMY MEDICAL RESEARCH INSTITUTE OF CHEMICAL DEFENSE	Pulmonary (Sulfur Mustard)
IAA (AOD25007-001)*	Toxicological Profiling of Acute Inhaled Aerosolized Epichlorohydrin	TRESSLER, JUSTIN	U.S. ARMY MEDICAL RESEARCH INSTITUTE OF CHEMICAL DEFENSE	Pulmonary (Epichlorohydrin)
R21 ES036166*	Defining Molecular Target of Arsenic Gas-Induced Acute Kidney Injury and Associated Morbidity	SRIVASTAVA, RITESH K	UNIVERSITY OF ALABAMA AT BIRMINGHAM	Pulmonary (Arsenic)
R21 ES037250*	Medical Countermeasures to Chlorine Exposure Based on GABA(A) Receptor Targeting	ARNOLD, ALEXANDER	UNIVERSITY OF WISCONSIN MILWAUKEE	Pulmonary (Chlorine)
R21 ES036419*	Electrophilic Fatty Acids Reduce Chlorine-Lung Toxicity via Inhibition of Macrophage Activation	GOW, ANDREW J	RUTGERS BIOMEDICAL AND HEALTH SCIENCES	Pulmonary (Chlorine)
R01 HL031197	Mitochondrial DNA Injury Is a Key Contributor to The Development of Chemical Lung Injury	MATALON, SADIS	UNIVERSITY OF ALABAMA AT BIRMINGHAM	Pulmonary (Chlorine)
R01 ES034416	Characterizing Chemical Threat Agent Exposures Using	MURPHY, SEAN VINCENT	WAKE FOREST UNIVERSITY	Pulmonary

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	a Lung-On-A-Chip Platform and Multi-Omic Analysis of Common Pathophysiological Mechanisms		HEALTH SCIENCES	(Various Toxic Industrial Materials & Related Chemicals)
R01 ES034419	Pulmonary Pathophysiological Mechanisms of Chloropicrin and Phosgene	VAN WINKLE, LAURA S	UNIVERSITY OF CALIFORNIA AT DAVIS	Pulmonary (Chloropicrin & Phosgene)
R01 ES034490	Pathophysiological Mechanisms of Chemical-Induced Acute Lung Injury	LEIKAUF, GEORGE DOUGLAS	UNIVERSITY OF CINCINNATI	Pulmonary (Acrolein & Phosgene)
R01 ES035431	Vascular Injury and Repair Predict Divergent Late Onset Cardiovascular Morbidities After Chlorine and Sulfur Mustard Exposure	VERESS, LIVIA AGNES	UNIVERSITY OF COLORADO DENVER	Pulmonary (Sulfur Mustard & Chlorine)
R01 ES035365	Lipid and Metabolic Mechanisms Responsible for Phosgene and Phosphorus Trichloride Exposure Toxicity	FORD, DAVID A	SAINT LOUIS UNIVERSITY	Pulmonary (Phosgene & Phosphorus Trichloride)
R01 ES036518	Role of Proteolytic Extracellular Vesicles in Halogen Gas Dependent Chronic Lung Injury	PATEL, RAKESH P (contact) GENSCHMER, KRISTOPHER R	UNIVERSITY OF ALABAMA AT BIRMINGHAM	Pulmonary (Chlorine & Bromine)
R01 ES037601*	Mast Cell Activation as a Common Mechanism of Pulmonary Toxicity by Chemical Threat Agents	BROWN, JARED MICHAEL (contact) BAUER, ALISON K TEWARI-SINGH, NEERA	UNIVERSITY OF COLORADO DENVER	Pulmonary (Chloropicrin & Formaldehyde)
R01 ES037611*	Studying The Mechanisms of Delayed Lung Injury Post-Arsenical Exposures	SUROLIA, RANU	UNIVERSITY OF ALABAMA AT BIRMINGHAM	Pulmonary (Lewisite, Phenylarsine Oxide, & Arsenic Trioxide)
R56 ES037610*	Targeting The Endocannabinoid Signaling in Chemical Threat Agents-Induced Lung Injury	NAGRE, NAGARAJA	OLD DOMINION UNIVERSITY	Pulmonary (Nitrogen Mustard & Ammonia)
U01 ES033263	Novel Lead Compound Advancement for Mitigating Halogen-Induced Mortality and Morbidity	AHMAD, SHAMA	UNIVERSITY OF ALABAMA AT BIRMINGHAM	Pulmonary (Chlorine & Bromine)
UG3 ES035689	Identification and Optimization of Medical Countermeasures for Phosgene Inhalation Injuries	ACHANTA, SATYANARAYANA	DUKE UNIVERSITY	Pulmonary (Phosgene)

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R41 AI187083	A Novel, Host-Directed Therapeutic for the Treatment of Sulfur Mustard Induced Lung Injury	VERESS, LIVIA AGNES	CMTX BIOTECH, INC.	Pulmonary (Sulfur Mustard)
IAA (AOD25007-001)	Inhaled Carfentanil Aerosol or Powder in African Green Monkeys: Toxicity Characterization and Efficacy of Treatments	MYERS, TODD	U.S. ARMY MEDICAL RESEARCH INSTITUTE OF CHEMICAL DEFENSE	Ultra-Potent Synthetic Opioids (Carfentanil)
IAA (AOD25007-001)	Investigating the Toxicology of Potent Synthetic Opioids and the Efficacy of FDA Approved Antagonists	RACINE, MICHELLE	U.S. ARMY MEDICAL RESEARCH INSTITUTE OF CHEMICAL DEFENSE	Ultra-Potent Synthetic Opioids (Acetylfentanyl, Etonitazene, Metonitazene, & Isonitazene)
IAA (AOD25007-001)	Characterization of Nitazene Kinetics and Toxicity: Therapeutic Efficacy of Available Opioid Antagonists	WESLEY, KATHERINE	U.S. ARMY MEDICAL RESEARCH INSTITUTE OF CHEMICAL DEFENSE	Ultra-Potent Synthetic Opioids (Etonitazene, Metonitazene, & Isonitazene)
R21 DA061215	Xylazine And Fentanyl Effects on Rat Breathing, Metabolism, And Thermoregulation	COTTEN, JOSEPH F	MASSACHUSETTS GENERAL HOSPITAL	Pharmaceutical-based Agent (Fentanyl & Xylazine)
R21 DA058834	Macrocyclic Arenes as Sequestrants for Drugs of Abuse	ISAACS, LYLE D	UNIV OF MARYLAND, COLLEGE PARK	Ultra-Potent Synthetic Opioids (Etonitazene, Metonitazene, & Isonitazene)
R21 DA057513	Functional Efficacy of Cannabidiol in Modulating the Abuse Liability and Adverse Effects of Opioids in Primates	KO, MEI-CHUAN	UNIVERSITY OF PITTSBURGH AT PITTSBURGH	Pharmaceutical-based Agent (Diacetylmorphine)
R21 DA061073	Cardiorespiratory Pharmacodynamics of Fentanyl-Xylazine	HEERDT, PAUL MARK	YALE UNIVERSITY	Pharmaceutical-based Agent (Fentanyl & Xylazine)
R21DA061319*	Fentanyl and Xylazine Interactions: Toxicity Produced by "Tranq-Dope"	SMITH, MARK	DAVIDSON COLLEGE	Pharmaceutical-based Agent

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				(Fentanyl, Heroin, Carfentanil, Xylazine, & Medetomidine)
R01 DA056658	Transcriptomic Single-Cell Profiling in Breathing-Specific Parabrachial Mu-Opioid Receptor Neurons	HAN, SUNG	SALK INSTITUTE FOR BIOLOGICAL STUDIES	Ultra-Potent Synthetic Opioids (Fentanyl)
R01 DA059063	Mechanism And Countermeasure of Carfentanil Induced Respiratory Disorder and Death	XU, FADI	LOVELACE BIOMEDICAL RESEARCH INSTITUTE	Ultra-Potent Synthetic Opioids (Fentanyl & Carfentanil)
R01 DA059060	Genetic Variation of Ultra-Potent Synthetic Opioid Sensitivity in Mice	BUBIER, JASON	JACKSON LABORATORY	Ultra-Potent Synthetic Opioids (Fentanyl)
R01 DA061320	Serotonin Mechanisms in Fentanyl-Induced Respiratory Depression	LEVITT, ERICA SAWYER	UNIVERSITY OF MICHIGAN AT ANN ARBOR	Ultra-Potent Synthetic Opioids (Fentanyl)
R01 DA061412	Investigating The Mechanistic Consequences of Fentanyl-Induced Hypoxia and Cardiorespiratory Collapse	GARCIA, ALFREDO J (contact) SHARP, WILLARD WILLIAM	UNIVERSITY OF CHICAGO	Ultra-Potent Synthetic Opioids (Fentanyl)
R01 DA061769*	Development of Computational and AI/ML Tools to Accelerate Discovery of Vaccines and Antibodies Against Nitazenes and Fentanyl Analogs	PRAVETONI, MARCO	UNIVERSITY OF WASHINGTON	Ultra-Potent Synthetic Opioids (Fentanyl & Nitazenes)
R01 DA063220*	Dissecting the Mechanisms Underlying Fentanyl-Induced Cardiorespiratory Depression	MORON-CONCEPCION, JOSE A	WASHINGTON UNIVERSITY	Ultra-Potent Synthetic Opioids (Fentanyl)
R56 DA064273*	Combining Experiments, Simulations, and AI to Interrogate the Pharmacology of Fentanyl and Nitazene Derivatives	SHEN, JANA	UNIVERSITY OF MARYLAND BALTIMORE	Ultra-Potent Synthetic Opioids (Alfentanil, Fentanyl, Sufentanil, Carfentanil, Buto-, Meto-, Isoto-, & Etonitazene)
K01 DA062777*	Investigation into nTS mu Opioid Receptor Mechanisms Contributing to Fentanyl-Induced Cardiorespiratory Depression	RUYLE, BRIAN C	WASHINGTON UNIVERSITY	Ultra-Potent Synthetic Opioids (Fentanyl)

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R01 HL174373	K-Opioid Receptor Activation of The Carotid Body Mitigates OIRD By Fentanyl	PRABHAKAR, NANDURI R	UNIVERSITY OF CHICAGO	Ultra-Potent Synthetic Opioids (Fentanyl)
R01 HL174547	Brainstem Mechanisms of Opioid-Induced Respiratory Depression	LEVITT, ERICA SAWYER	UNIVERSITY OF MICHIGAN AT ANN ARBOR	Ultra-Potent Synthetic Opioids (Fentanyl)
R01 HL144801*	Unraveling the Dynamic Mechanisms Underlying Opioid Respiratory Depression	RAMIREZ, JAN M	SEATTLE CHILDREN'S HOSPITAL	Ultra-Potent Synthetic Opioids (Fentanyl)
IAA (AOD25008-001)	Investigating 2,4-Dinitrophenol and The Development of Countermeasures for Its Toxic Effects	MCCRANOR, BRYAN	U.S. ARMY MEDICAL RESEARCH INSTITUTE OF CHEMICAL DEFENSE	Cellular Respiration / Metabolic Dysfunction (2,4-Dinitrophenol)
IAA (AOD25008-001)	Characterizing The Toxicological, Physiological, And Neurological Impacts of Aliphatic Nitriles in A Rat Model	MORGAN, JULIA	U.S. ARMY MEDICAL RESEARCH INSTITUTE OF CHEMICAL DEFENSE	Cellular Respiration / Metabolic Dysfunction (Cyanide, Acrylonitrile, Isobutyronitrile, Methacrylonitrile, Propionitrile, Hydroxyacetoneitrile)
R56 NS144203*	Mechanisms of Cyanide-Induced Neurotoxicity and Purine Dysregulation	NATH, ANJALI	BETH ISRAEL DEACONESS MEDICAL CENTER	Cellular Respiration / Metabolic Dysfunction (Cyanide)
UG3 NS134957	Platinum Based Countermeasures and Combinations with Protective Agents	DAVISSON, VINCENT JO	PURDUE UNIVERSITY	Cellular Respiration / Metabolic Dysfunction (Cyanide)
R44 AI191943*	Development of Cobinamide as a Cyanide Antidote: Completion of pre-IND Studies	DRETCHEN, KENNETH (contact) BOSS, GERRY R	MESA SCIENCE ASSOCIATES, INC.	Cellular Respiration / Metabolic Dysfunction (Cyanide)
IAA (AOD25006-001)	Exploring The Primary and Transgenerational Effects of Acute Organophosphate Exposure and Treatment During Early Gestation in Genetically Modified Human-Relevant Mice	CADIEUX, LINN	U.S. ARMY MEDICAL RESEARCH INSTITUTE OF CHEMICAL DEFENSE	Neurological (Anti-Neurodegeneration; Paraoxon, Sarin)

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IAA (AOD25006-001)	Age and Sex Differences in Neurotoxic Effects of Seizure-Inducing Chemicals and Response to Anti-Seizure Medications and Novel Neuroprotectants	LUMLEY-LANGE, LUCILLE	U.S. ARMY MEDICAL RESEARCH INSTITUTE OF CHEMICAL DEFENSE	Neurological (Anti-Seizure / Anti-Neurodegeneration; Soman)
IAA (AOD25006-001)	Developing a Mouse Model of Organophosphate-Induced Delayed Neuropathy Using Plasma Carboxylesterase-Deficient Mice for Therapeutics Evaluation	MA, KI	U.S. ARMY MEDICAL RESEARCH INSTITUTE OF CHEMICAL DEFENSE	Neurological (Anti-Seizure / Anti-Neurodegeneration; Diisopropyl Fluorophosphate, Tri-ortho-cresyl Phosphate, & Sarin)
IAA (AOD25006-001)	Mechanism Investigation and Countermeasure Identification for Acute Exposure to Hydrazine in Rats	SANTORO, ANTONIA	U.S. ARMY MEDICAL RESEARCH INSTITUTE OF CHEMICAL DEFENSE	Neurological (Anti-Seizure; Hydrazine)
R21 NS127345	High-Throughput In Vivo Discovery of Novel Countermeasures Against Organophosphate-Induced Seizure and Status Epilepticus Using Zebrafish	MCGRAW, CHRISTOPHER	NORTHWESTERN UNIVERSITY	Neurological (Anti-Seizure; Chlorpyrifos)
R21 NS136070	Inhibiting MPGES-1 As A Countermeasure to Mitigate Organophosphate-Induced Neurotoxicity	JIANG, JIANXIONG	UNIVERSITY OF TENNESSEE HEALTH SCI CTR	Neurological (Anti-Neurodegeneration; Diisopropyl Fluorophosphate)
R21 NS136126	Inflammation And White Matter Microstructural Alterations After OP Exposure	MARINI, ANN M	HENRY M. JACKSON FDN FOR THE ADV MIL/MED	Neurological (Anti-Neurodegeneration; Diisopropyl Fluorophosphate)
R01 NS133584	Mechanisms Of Neurodegeneration in A Nerve Agent Model	THIPPESWAMY, THIMMASETTAPPA	IOWA STATE UNIVERSITY	Neurological (Anti-Seizure / Anti-Neurodegeneration; Diisopropyl Fluorophosphate)
R01 NS136102	MALDI Imaging of Acute Organophosphate Exposure in KIKO Mice	TRESSLER, CAITLIN	JOHNS HOPKINS UNIVERSITY	Neurological (Anti-Neurodegeneration; Sarin)

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R01 NS144287*	Impaired Sleep as a Target for Intervention Following Acute Organophosphate Intoxication	ANACLET, CHRISTELLE (contact) GURKOFF, GENE GABRIEL	UNIVERSITY OF CALIFORNIA AT DAVIS	Neurological (Anti-Neurodegeneration; Diisopropyl Fluorophosphate)
U01 NS123255	Optimization of Substituted Phenoxyalkyl Pyridinium Oximes as Therapies for Organophosphate Poisoning	CHAMBERS, JANICE ELAINE	MISSISSIPPI STATE UNIVERSITY	Neurological (AChE Reactivator; Sarin & VX Surrogates)
U01 NS123252	Antiglutamatergic Therapy to Protect the Brain Against Nerve Agents	BRAGA, MARIA F.	HENRY M. JACKSON FDN FOR THE ADV MIL/MED	Neurological (Anti-Seizure / Anti-Neurodegeneration; Soman)
U01 NS117284	Saracatinib and 1400W Counteract Nerve Agents-Induced Long-term Neurotoxicity	THIPPESWAMY, THIMMASETTAPPA	IOWA STATE UNIVERSITY	Neurological (Anti-Seizure / Anti-Neurodegeneration; Diisopropyl Fluorophosphate, Soman & VX)
UG3 NS138911*	Novel Anticonvulsants for Nerve Agents and Refractory Status Epilepticus	REDDY, DOODIPALA SAMBA	TEXAS A&M UNIVERSITY HEALTH SCIENCE CTR	Neurological (Anti-Seizure / Anti-Neurodegeneration; Diisopropyl Fluorophosphate & Soman)
UH3 NS133630	Identification And Optimization of Verapamil as A Novel Neuroprotective and Anti-Inflammatory Agent for Reducing Long-Term Neurological Morbidities Following Organophosphate-Induced Status Epilepticus	DESHPANDE, LAXMIKANT S	VIRGINIA COMMONWEALTH UNIVERSITY	Neurological (Anti-Seizure / Anti-Neurodegeneration; Diisopropyl Fluorophosphate)
UH3 NS134920	Long-Acting Aldicarb Hydrolase as a Medical Countermeasure for Aldicarb Poisoning	ZHENG, FANG	UNIVERSITY OF KENTUCKY	Neurological (Scavenger; Aldicarb)
U54 NS127758	UC Davis CounterACT Center of Excellence: Developing Therapeutic Strategies for Mitigating the Chronic Neurological Consequences of Acute Organophosphate Intoxication	LEIN, PAMELA J	UNIVERSITY OF CALIFORNIA AT DAVIS	Neurological (Anti-Seizure / Anti-Neurodegeneration; Diisopropyl Fluorophosphate & Soman)

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IAA (AOD25008-001)	Superwarfarin Sequestration by Cyclodextrin-Based Macrocycles	ZIEGLER, ERIC	U.S. ARMY MEDICAL RESEARCH INSTITUTE OF CHEMICAL DEFENSE	Blood Toxicity (Coagulopathy; Brodifacoum)
R21 NS137528	Development Of Novel Anticoagulant Antidotes Using Zebrafish	SHAVIT, JORDAN A	UNIVERSITY OF MICHIGAN AT ANN ARBOR	Blood Toxicity (Coagulopathy; Brodifacoum)
U01 NS127746	Optimization of Bile Sequestrants to Treat Superwarfarin Poisoning	FEINSTEIN, DOUGLAS L.	UNIVERSITY OF ILLINOIS AT CHICAGO	Blood Toxicity (Coagulopathy; Brodifacoum)
R13 AR085979*	Innovations in Countermeasures and Toxicology Research	LU, KURT	NORTHWESTERN UNIVERSITY AT CHICAGO	N/A
NIAID Product Development Support Services (PDSS) for Medical Countermeasures Against Chemical Threats	Preclinical Development Resources (PDR)	CHANG, POLLY & GREEN, CAROL (PIs) MAI, BONNIE (PM)	SRI (MENLO PARK, CA)	N/A
	Preclinical Efficacy Evaluation Development Resources (PEER)	BESKE, PHILIP (PI) SMITH, CARSON (PM)	BATTELLE (COLUMBUS, OH)	N/A

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