

Military Toxicology – Army Public Health Center/ Tri-Service Toxicology Consortium



ARMY PUBLIC HEALTH CENTER



**Mark S. Johnson, Ph.D, DABT, ATS
Director, Toxicology
Army Public Health Center**

September 18, 2017

Strategic Goal: Encourage the adoption and use of new methods and approaches by federal agencies and regulated industries.

- **Agencies should adopt clear language regarding the acceptance of NAMs.**
- **Agencies should collaborate with international partners to facilitate global harmonization and regulatory acceptance.**
- **Agencies and stakeholders should work together to explore processes to incentivize and promote the use of NAMs.**
- **All stakeholders should endeavor to identify appropriate metrics for prioritizing activities, monitoring progress, and measuring success.**

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ONE HEALTH

PEOPLE ♦ ANIMALS ♦ ENVIRONMENT

U.S. Army Public Health Command

Fall 2014

HIGHLIGHTS

Army scientists collaborate to investigate toxicology

LISA L. MORRIS
ARMY MEDICINE

PERCHLORATE IS A COMMONLY USED OXIDIZER NECESSARY FOR SOLID ROCKET ENGINES AND SOME PYROTECHNICS. As extensive as its use is, an increasing number of studies show perchlorate contamination can have negative effects on the environment and human health. It inhibits the function of the thyroid when individuals are consistently exposed at part per billion levels through the drinking water.

The U.S. Army Public Health Command, Toxicology Portfolio has been working with developers at the Armament Research and Development Center to find a replacement for perchlorate that is less toxic and less mobile in the environment. One proposed replacement is periodate, explained Dr. Mark Johnson, Toxicology Portfolio director.

“Periodate has been evaluated by the Toxicology Portfolio in studies to address human health concerns and make a recommendation in the form of a Toxicity Assessment. However, inhibitory effects to the thyroid are best evaluated using a sensitive model species,” Johnson said.

The USACEHR’s role in the study itself includes an extensive preparation period and three 21-day test periods, all of which will take approximately one year to complete.

“We’re really looking forward to this because within the USAMRMC, we’re the only lab with this capability,” said Col. Thomas Timmes, USACEHR commander. “We have a very unique aquaculture mission.”

The USACEHR’s unique aquaculture facilities allow their scientists to house and study frogs as opposed to other USAMRMC labs that may study rodents or other small mammals.

With other USAMRMC labs attracted to the USACEHR’s unique capabilities, the USACEHR will invite other veterinarians to visit and learn from the study. ▲

Jane Gervasoni, USAPHC, contributed to this story.

ONE HEALTH

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U.S. Army Public Health Command

Summer 2015

ORGANIZATION DAY

PLUS:

- BSHOP program overview
- Army scientists visit high school



MISSION

WHAT IS GOING DOWN THE DRAIN?

The U.S. Army Medical Command is at the forefront in identifying and quantifying the pharmaceuticals and personal care products, or PPCPs, that end up in the wastewater discharges from its hospitals, clinics and veterinary facilities—all to help protect the health of Soldiers, their families and the environment.

In the interest of public health, the U.S. Army Public Health Command Water Resources Program is studying what is going down the drain at Army hospitals. They are working to identify and quantify the PPCPs in the wastewater discharge from a major military hospital and determine the ability of the water treatment plant to remove the compounds.

These PPCPs include prescription and over-the-counter drugs used by humans and animals, topical grooming products like shampoo and perfume, water-repellent products such as cholesterols, and herbicides, according to Jennifer Gaudin, an environmental engineer at the USAPHC Water Resources Program.

“Pharmaceuticals and personal care products have become contaminants of emerging concern due to their extensive use and increasing presence in water resources,” Gaudin said.

PPCPs make their way into the wastewater system through human or animal use, human or animal excretion, improper disposal, and from waste material used in hospital procedures such as chemotherapy.

Limited research has been done on the effects of PPCPs on the environment and human health because the concentrations of these compounds tend to be very small, and until recently, detection of low levels of these PPCPs was not possible.

We sampled for 15 compounds, and our laboratory analysis found that 46 compounds were discharged in the wastewater from the hospital,” Gaudin said. “Our analysis determined that the military hospital had a very small contribution of PPCPs when compared to the incubation as a whole, and the wastewater treatment plant was effective at removing the majority of PPCPs.”

continued on page 14

HIGHLIGHTS



MAJ. SANG LEE
TOXICOLOGY PORTFOLIO

People are accustomed to thinking of animals as pets, but at the U.S. Army Public Health Command, they also help assess possible adverse health effects from military-relevant materials on warfighters and the supporting civilian workforce.

Extra species as exotic as quail contribute to supporting warfighters and the military civilian workforce. These birds are essential animal models in studying the health effects of some chemical materials. And though one cannot totally eliminate the use of such animals in health research, scientists are encouraged to take the extra step in protecting their welfare while they are under an organization’s care. The Toxicology Portfolio in

conjunction with Quality Systems and Regulatory Compliance Office of the USAPHC has taken that extra step. A biological science technician from the Toxicology Portfolio visited a local agricultural feed store where chicks were housed in a large rubber bin big enough for them to roam about freely. It occurred to her that a similar environment could house the Japanese quail that were to be used in an upcoming study to help ensure their comfort and welfare. She took some photos and suggested the idea to the biologist in charge of the study.

“The chicks looked so happy. That’s what we should do for the quail,” was the message sent along with the photo to the biologist in charge of planned quail study.

The idea for a home makeover was reviewed by the program manager at the Toxicology Portfolio. He agreed that the study staff should pursue this idea as an interim solution until a suitable stainless steel caging system, as recommended by the previous attending veterinarian and USAPHC Institutional Animal Care and Use Committee, could be located.

A design was drafted that was intended for freely-hatched chicks and juvenile birds. The design was simple and consisted of a 54-gallon rubber tub with holes drilled on one end to attach PVC pipes to deliver water. The tub was covered with mesh top to allow good circulation of air and light. The home makeover became a project supported by many of the portfolio scientists and technicians.

The primary reason for the new accommodation was to promote the welfare of quail by providing the best housing and care for them. Members of the USAPHC’s Institutional Animal Care and Use Committee also supported this innovative system to house the birds and commended those who developed the housing.

Previous commercial brooder caging systems had a mesh flooring that sometimes caught the tiny quail-chick feet. Even when scientists implemented smaller mesh floor nesting, there were still a few weekly losses

despite all efforts. The new tub caging system resulted in no losses, even after being in use for a few months. “They worked even better than I could have possibly imagined. We didn’t have an injury to the quail,” said the biological technician. The new units also served to help the workforce have a better ergonomic working environment. Commercial cages presented ergonomic challenges to researchers when reaching into the cages trying to remove the agile birds. The task often resulted in bruised arms, hands, fingers and a lot of frustration. “We used to get bruised all over our arms and hands. It’s so much easier now with the new set-up,” explained the program manager after a few months of use.

Both these issues concerning bird and worker welfare were solved thanks to the efforts of a few forward-thinking individuals and supporting staff who showed exceptional concern for the animals and were willing to take a few extra steps by thinking outside the box. Recently, a new stainless steel potential has been identified as a more permanent potential brooder system for the quail and is currently being evaluated by USAPHC’s Quality Systems and Regulatory Compliance Office. ▲



The U.S. Army Center for Environmental Health Research will house African clawed frogs to study toxicity levels in periodate, a compound that could be used to replace perchlorate. (Photo courtesy USACEHR)

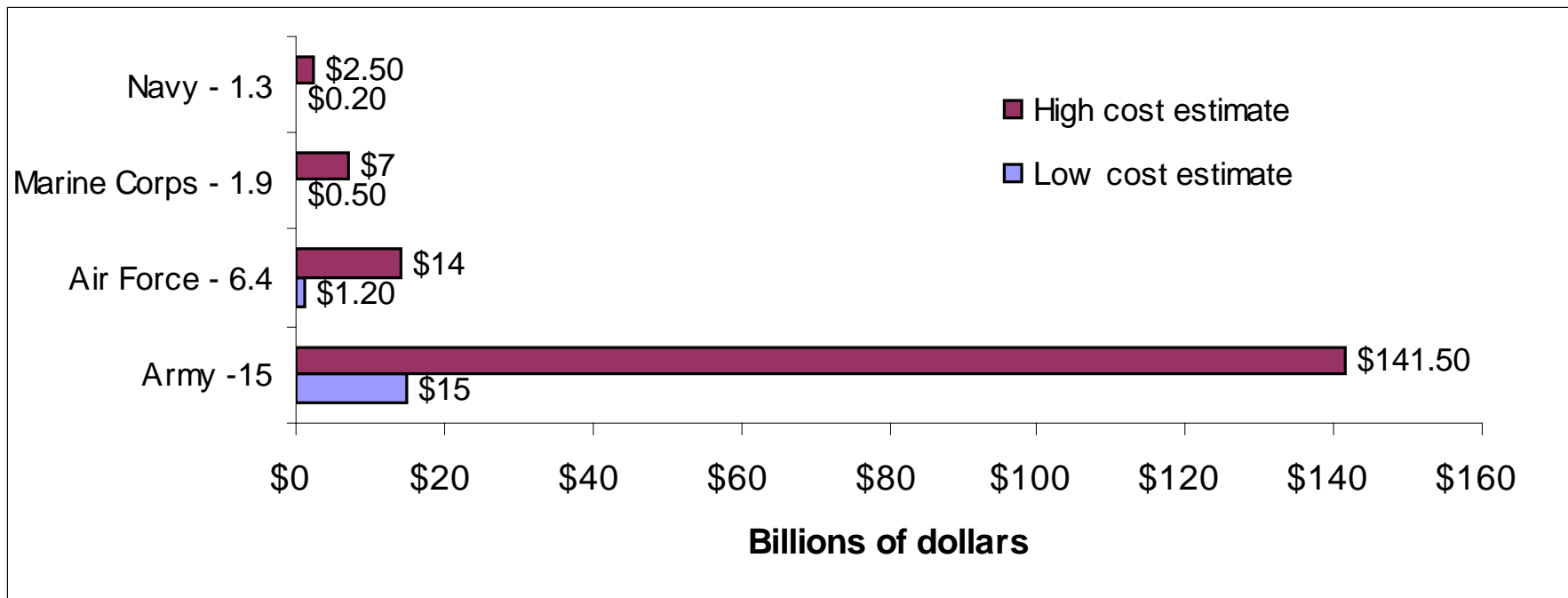


Small quail cages were made from 54-gallon rubber tubs with holes drilled on one end to attach PVC pipes to deliver water. Tubs were covered with mesh tops to allow the circulation of air and light.

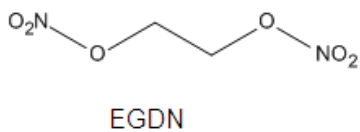
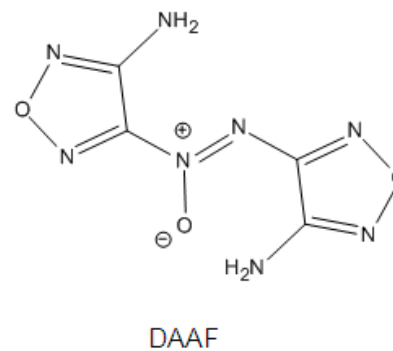
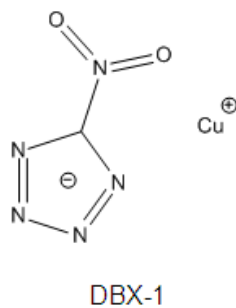
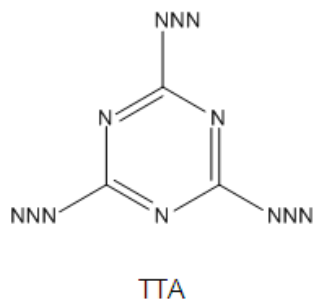
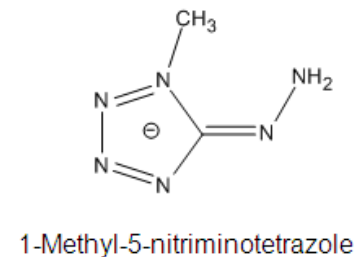
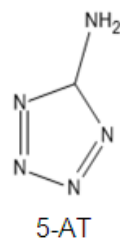
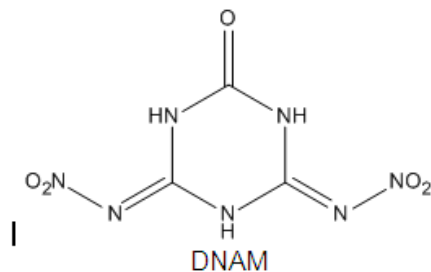
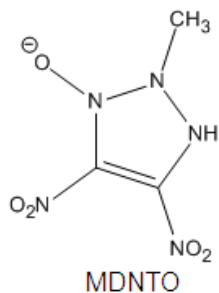
Installation Boundary

Urban sprawl

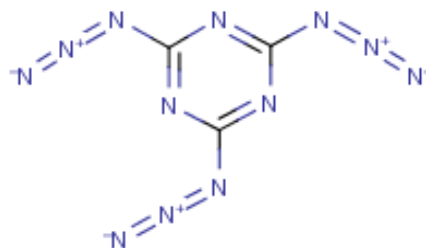
Range Cleanup Estimates



GAO 2004. Operational Ranges Report, 04-0601



Chemical Structures

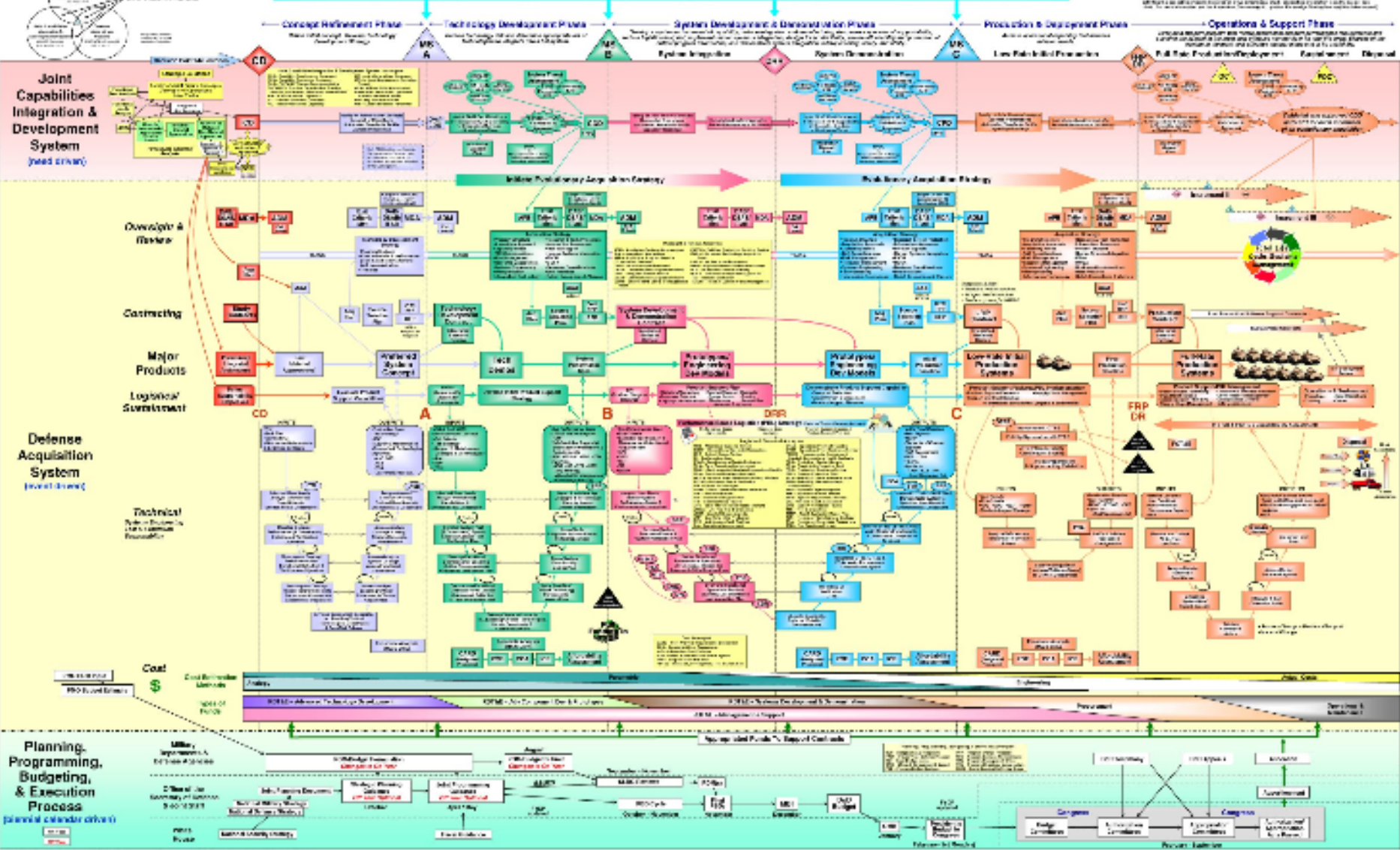


10-11 August 2010

Integrated Defense Acquisition, Technology, & Logistics Life Cycle Management Framework

The Mission Decision Authority's new authority over the acquisition process at any point, combined with shared access to enterprise systems and statutory requirements

By a system's ability to be reconfigured and to be able to adapt to changing requirements, it can be reconfigured to meet new requirements. This is a key capability for the future of defense systems. The system must be able to adapt to changing requirements and be able to be reconfigured to meet new requirements. This is a key capability for the future of defense systems.



Army Regulation 40–5

Medical Services

- Preventive Medicine
- Chapter 1: Introduction
- Section I: General
 - 1–5. Preventive medicine policies
 - The army will-
 - *m. Ensure that all new chemicals and materials being added to the Army Supply System have a toxicity clearance.*
 - 1–7. Preventive medicine programs and services
 - *g. Preventive medicine toxicology and laboratory services.*
 - (a) Toxicological assessments of potentially hazardous materials.
 - (b) **Toxicity clearances** for Army chemicals and materiel.
 - (c) Toxicologically based assessments of health risks.

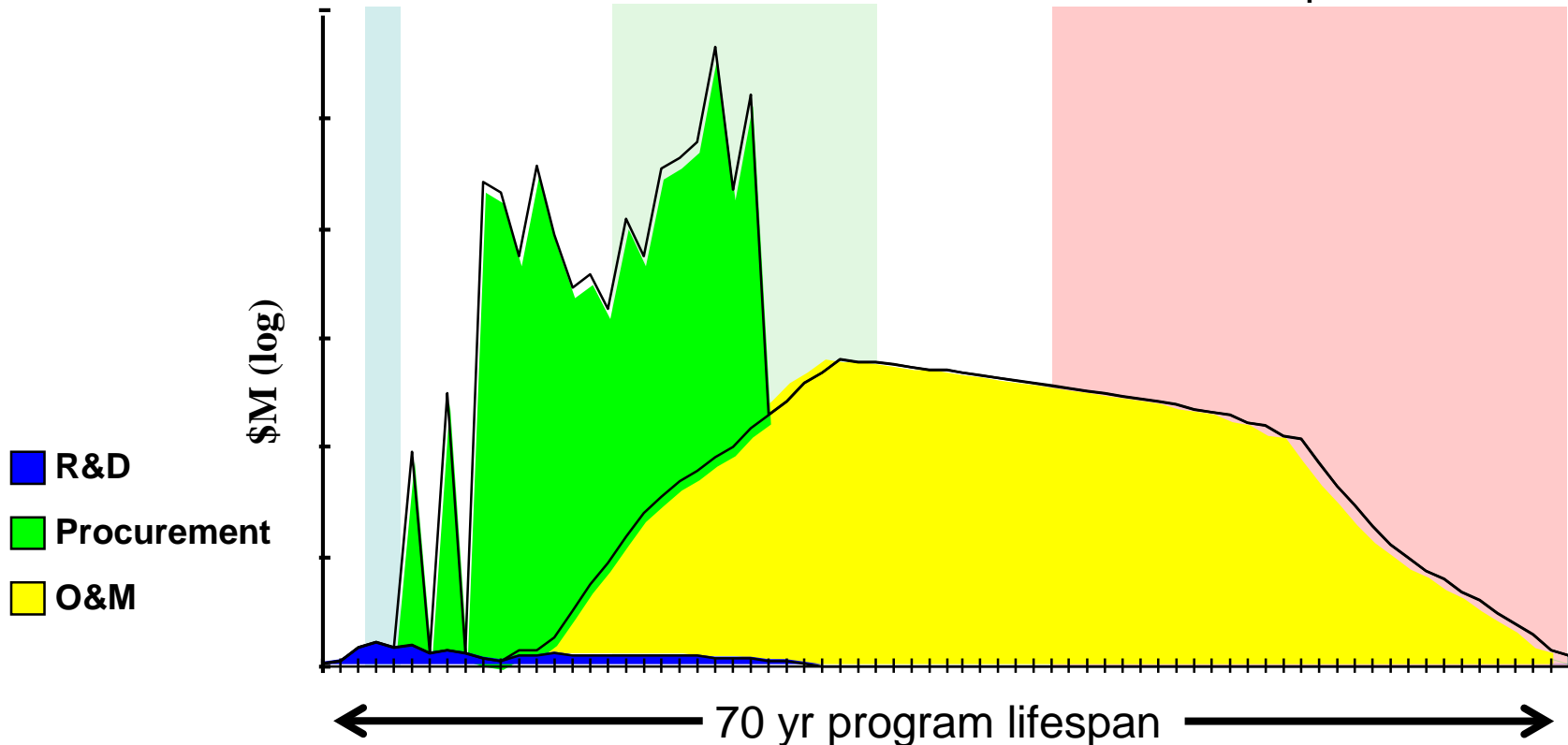


Integrate Risk Assessment Early

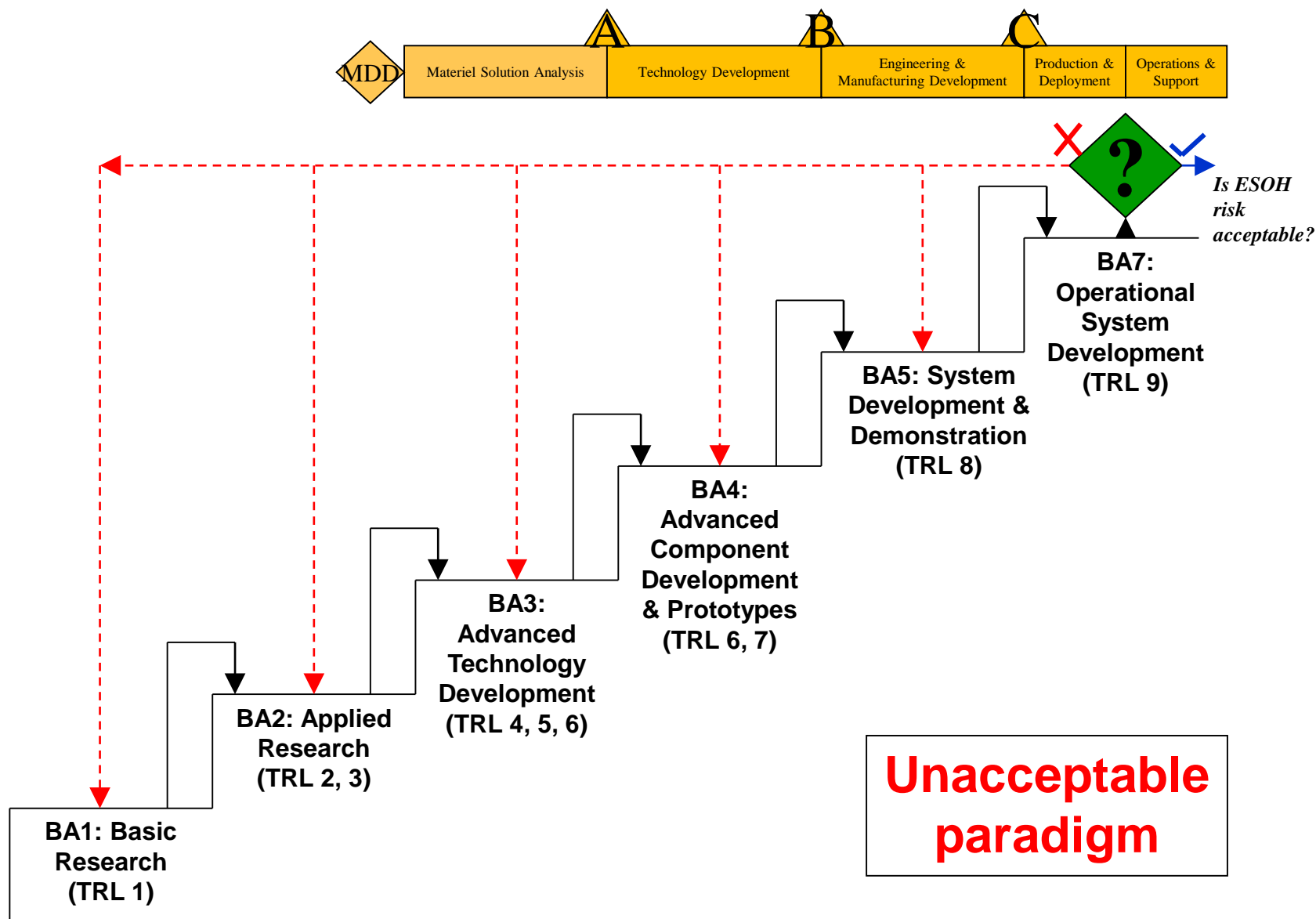
Decisions
made here...

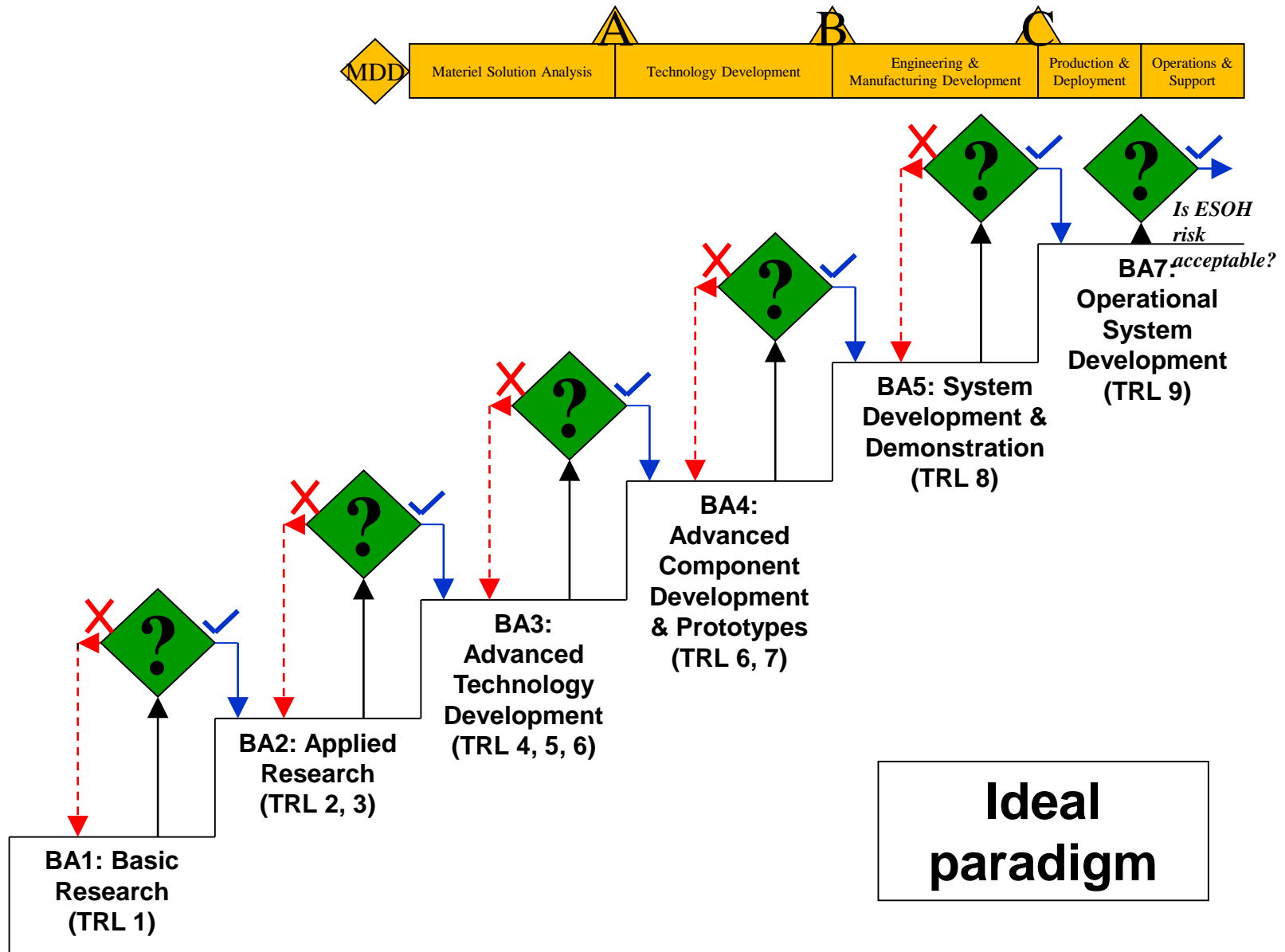
lock in 80-90%
of costs here...

and determine
mission impacts here



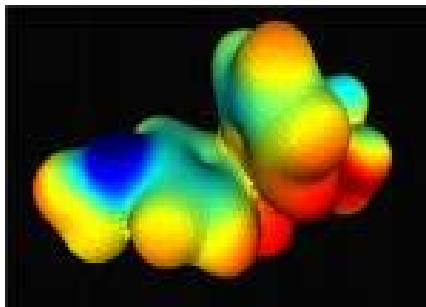
Early integration is the least expensive and most effective way to minimize the downstream cost, schedule, and performance impacts of any weapon system.



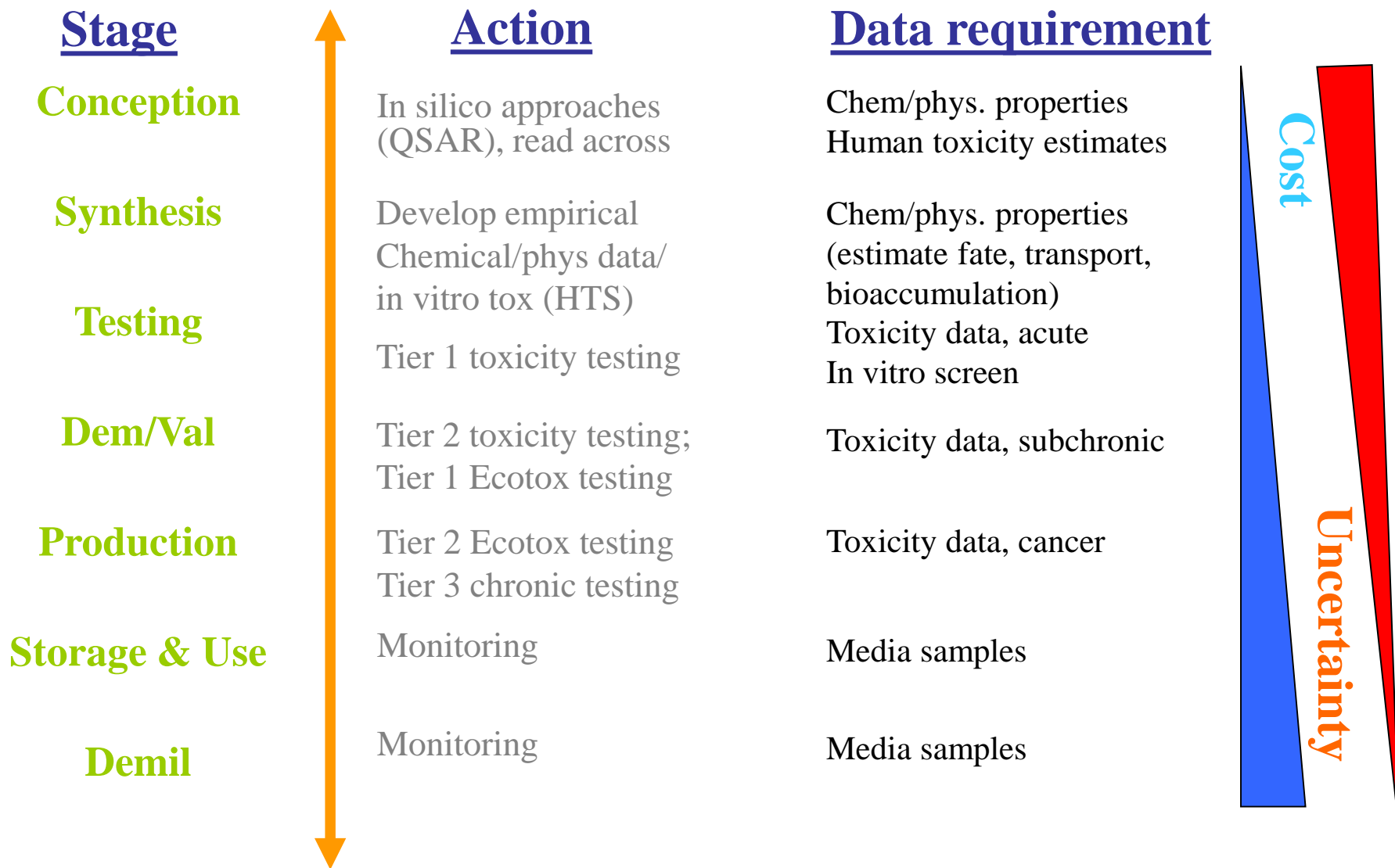


Levels of Weapon System/Platform Development

- **Conception** – computer simulation only
- **Synthesis** – labtop operation, small quantities
- **Demonstration/Validation** – refinement of synthesis, stabilization of mixtures, use of COTS.
- **Testing** – System evaluation
- **Production and Use**
- **Demilitarization**



New Compound Development Process



Application of the Phased Approach to Compound Development



- ASTM E-2552-16 Assessing Environmental and Human Health Impacts of New Compounds for Military Use
 - Toxicology Assessments – technical foundation of ESOH information.
- TTCP (The Technical Cooperative Program), Key Technical Area (KTA) 4-42: Development of a Framework to Assess the Environmental Impacts of Green Munition Constituents and of New energetic Formulations
- NATO/STO AVT – RLS-276 Environmental Management of Munition and Greener Approaches to Design (APG, MD; Bucharest, RU; Rijswijk, NE)



- M115, 116, 177 Simulators
 - Reformulated
- M-18 Smoke Grenade
 - Sulfur – sugar –based fuel
 - New dyes
- Lead-free primers
- IM toxicity data collection
- RDX replacements



- Army

- Public Health Center*†
- Medical Research Institute of Chemical Defense*†
- Edgewood Chemical Biological Center†
- Center for Environmental Health Research*†
- Engineering Research and Development Center†

† = RDT&E mission

* = Medical COC

Red text – tox laboratory

‡Toxicology service center

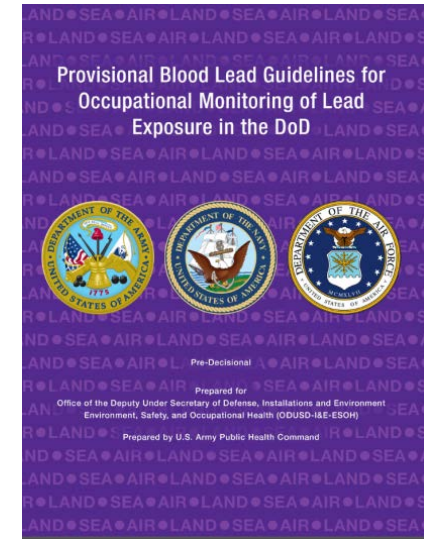
- Navy

- Navy Medical Research Unit Dayton (NAMRU/Dayton/SA)*†‡
- Navy and Marine Public Health Center*
- Naval Surface Warfare Center – Dahlgren†

- Air Force

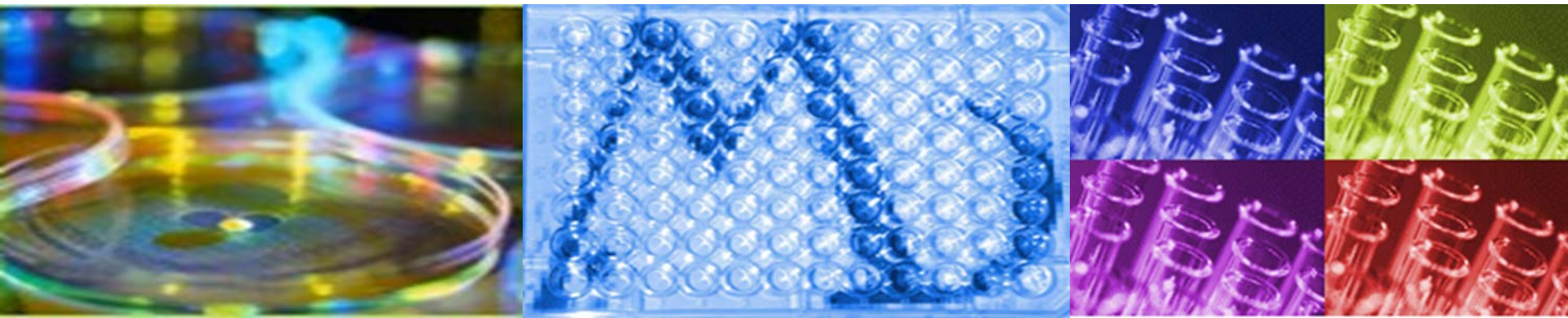
- 711 Human Performance Wing
 - School of Aerospace Medicine – Occ Health*/Research Dept.*
 - AFRL – Aerospace Toxicology Program†‡
- Air Force Civil Engineer Center

- Mission: To communicate, coordinate, and optimize toxicology services across the DoD.
- Three meetings/yr.
 - Aberdeen Proving Ground
 - Wright-Patterson AFB
 - SOT (2-hr meeting)
- Format:
 - Day 1: Seminars
 - Day 2: Collaborations/business
- Business
 - “Purpleize” technical reports, exposure benchmarks/peer review
 - Provisional Blood Lead Guidelines for Occupational Monitoring of Lead Exposure in the DoD
 - Evaluation of pharmacokinetic models for the disposition of lead (Pb) in humans, in support of application to occupational exposure limit derivation



- Organ on a chip – ACEHR, AFRL, DARPA, DTRA
- AOPs/Genomics/Proteomics/Metabolomics – ERDC, AFRL, MRICD
- PBPK – NAMRU, AFRL, APHC
- 3-D cultures/slices – AFRL, APHC, CEHR
- *In vitro* cultures – TSTC
- *In silico* (computational toxicology) – AFSAM, AFRL, APHC, ERDC
- Focused *in vivo* – NAMRU, APHC, AFRL, ERDC*

*Ecotox receptors

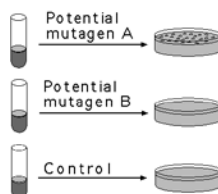
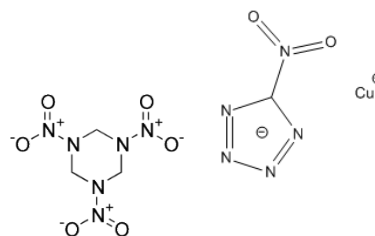


Mission: Promote health and prevent disease, injury, and disability of Soldiers and civilians by specializing and characterizing the toxicity of military-unique compounds and the risks they pose to humans and the environment.

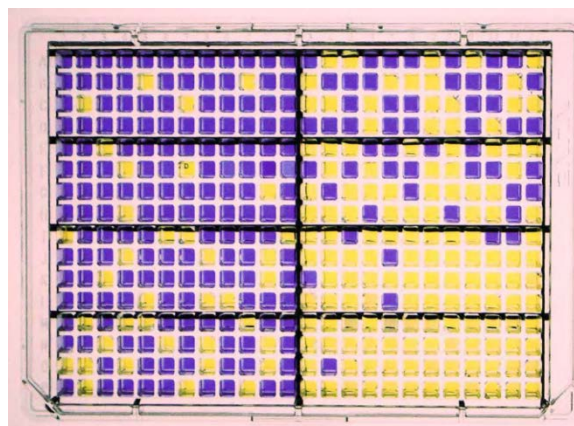
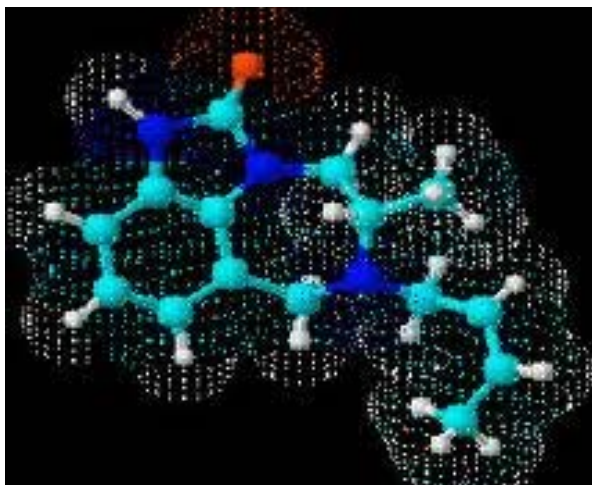
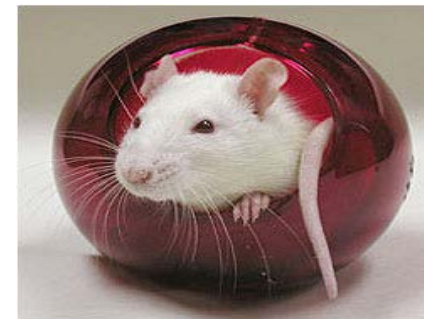


Toxicity Testing of New Military Materials

- Computer Modeling
- *In Vivo* Animal Studies
- *In Vitro* Assays
- Toxicity Assessments – RDT&E
- Toxicity Clearances - Acquisition
- Establish safe levels of exposure (Soldiers, Workers, Environment)



- Research Development Testing & Evaluation
- Computer Modeling
- *In Vitro* Assays
- *In Vivo* Studies
- AAALAC & GLP Compliant Laboratories
- QSAR/PBPK/BMDS



Support RDT&E and acquisition; Implemented money saving phased approach in ESOH data requirement (what data are needed when)



Implement cost-benefit toxicity testing in RDT&E transition to acquisition systems to ensure the health of Warfighters

Conducted over 39 Toxicity Clearances/Assessments for new chemicals for weapon systems/platforms



Prevent release of toxicant by providing timely toxicant information
Preventing entry of toxic systems/platforms into Army supply chain

Published 27 manuscripts/reports:
(15 presentations, platforms, posters)



"Provisional Blood Lead Standards for Occupational Monitoring of Lead Exposure in the DoD".

In Vitro Toxicity Study of New Munition Compounds (BA100-ADN, BA100-BTTN, and BZ1200-CL-20)

Acute Inhalation Toxicity Study in Rats Exposed to Aqueous Agents (Firebane 1179) Used for Automatic Fire Extinguishing Systems

**Conducted 5 *in vivo*,
10 *in vitro* studies**

Oral Toxicity of 3-Nitro-1,2,4-triazol-5-one (NTO) in Rats (*accepted*) Int. J. Toxicology

DOD-level leadership, coordination & collaboration



Agency/DoD POC for: National Academy of Sciences-Committee on Toxicology, Tri-Service Toxicology Consortium (agency lead); Tri-Service Environmental Risk Assessment Working Group; - Joint Army, Navy, NASA, Air Force (JANNAF) Safety & Environmental Protection Subcommittee



TOX Major Projects / Areas of Emphasis for FY18

- **Conserve Warfighters and civilian forces** via studies on toxicology of energetics (e.g., propellants, explosives, pyrotechnics) and fire extinguishers.
 - Continue testing new insensitive munition formulations (IMX-101), fire extinguishing agents, new proposed energetics.
 - Harmonize toxicity data requirements across acquisition and other services.
- **Ensure state-of-science program & facility to meet future needs**
 - Improve and advance methodologies, modeling, and technological capabilities.
 - Enhance internal technical support (pathology/histology, laboratory, veterinary); coordinate toxicology in DoD through TSTC.
- **Improve Toxicology Characterization for New Materials**
 - Deploy state-of-the-science tools to better characterize potential for adverse effects from exposures (soldiers, workers, and their families).
 - Integrate chemical property information in predicting exposures and sustainability.

MRICD Mission and Vision

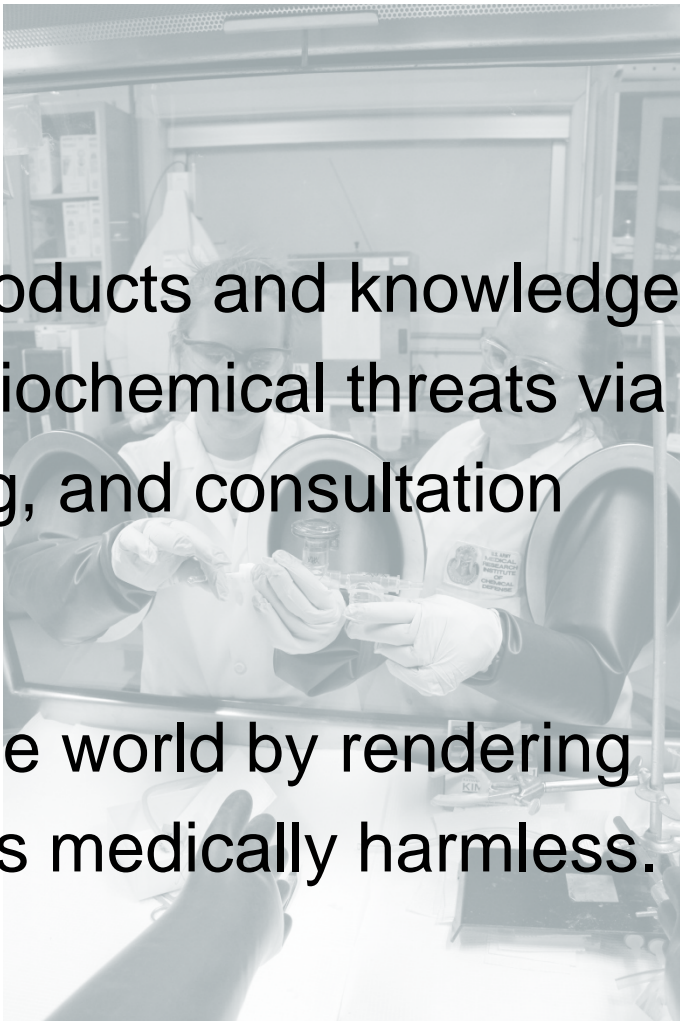


Mission

Discover and develop medical products and knowledge solutions against chemical and biochemical threats via research, education & training, and consultation

Vision

To strengthen our Nation and the world by rendering chemical and biochemical threats medically harmless.



Products



Critical studies on RSDL



**TestMate®
Cholinesterase Kit**



**Chemical Casualty Care
Reference Material**



Pyridostigmine



Nerve Agent Antidote Kit



Multichambered Autoinjector



SERPACWA



**Convulsant Antidote Nerve
Agent (CANA)**

Applied Research to Develop Animal Models of Toxicant Exposure

In Advanced Development:

- Advanced Anticonvulsant (AAS, midazolam)
- Bioscavenger (BSCAV, plasma derived hBChE)
- Improved Oxime (INATS, MMB4)
- Centrally Active Therapeutic (INATS, Scopolamine)



US ARMY Center for Environmental Health Research (USACEHR)



Located at Fort Detrick, MD, Subordinate command of the USAMRICD

Mission:

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



Three Primary Research Programs:

Integrative Systems Biology

Use of Systems Biology to understand, diagnose, treat military-relevant diseases (e.g. PTSD, traumatic coagulopathy)

Environmental Health Program

Identify molecular response(s) following exposure to environmental hazards (TIC/TIMs, ENM, etc.) in host organisms to inform the development of fieldable diagnostic capabilities, surveillance tools, and adverse health outcome predictions through the utilization of animal models, predictive toxicology methodology, microbiome analysis and end-organ toxicity investigation.



Pulmonary Health Research Program

Biomarkers of occupational and environmental exposures and deployment-related respiratory disease



Hosts Army and USAMRMC Assets:

Hosts the Army Chief Scientist for Systems Biology

Hosts USAMRMC Systems Biology Collaboration Center





USACEHR Accomplishments



Milestone C approval and expected FY17 fielding of biologically based water toxicity sensor-Environmental Sentinel Biomonitor (ESB).

Developed a panel of molecular biomarkers for clinical assessment of liver fibrosis.

Establishment of gnotobiotic facility for the study of interactions between toxicant exposure and the gut microbiome in humanized mice.

Ongoing development of the zebrafish larva as a high-throughput predictive toxicology tool.

Initiated development of a mobile application providing simplified access to NIOSH Pocket Guide to Chemical Hazards and other relevant chemical databases and exposure standards and guidelines.

Evaluated the toxicity of air-borne dusts from Iraq.

Evaluated the prevalence of asthma, COPD, sarcoid, and other lung diseases in deployed and non-deployed service members to Southwest Asia

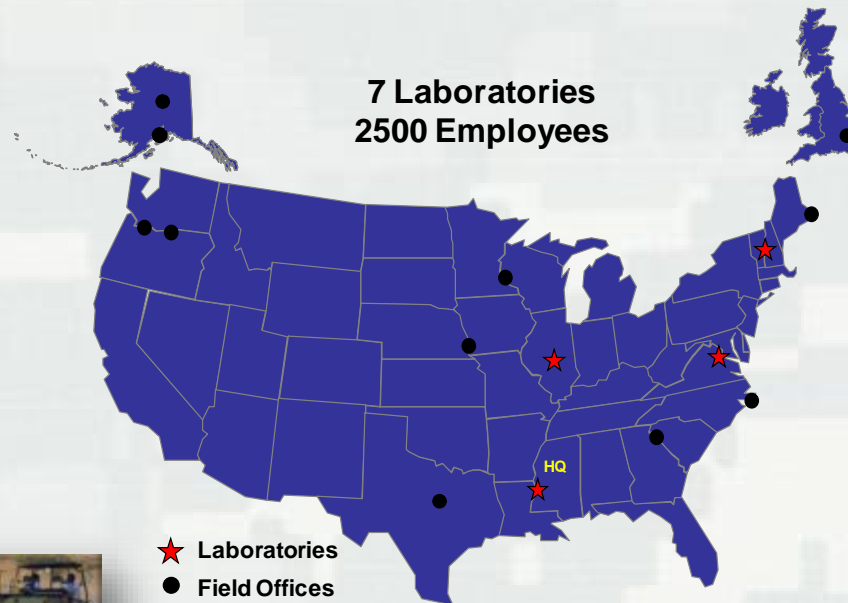
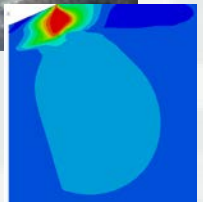
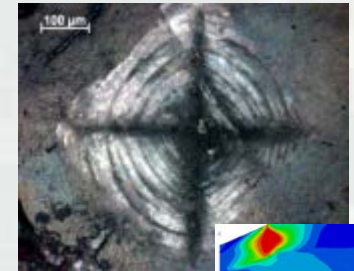


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US Army Engineer Research and Development Center

Research Areas

- Civil Works/Water Resources
- Environmental Quality/Installations
- Military Engineering
- Geospatial Research and Engineering



Military Materials in the Environment

PE 0602720A/0603728A

Motivation

- Exposure to military materials (i.e., explosives, propellants and smokes) can have detrimental effects on the environment
 - Sustainable use of resources
 - Advancement of environmental assessment, sensing, and decision making
 - Understanding risk of and evolving mitigation and management of existing and emerging chemicals and materials
 - Predictive chemical and toxicological tools for fate, transport and effects



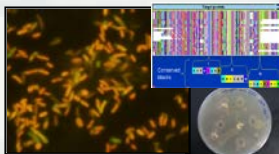
Technical capabilities

- Testing to determine impact of chemicals on aquatic species
- Tools that guide and influence advanced material design
- Technologies to control emerging material transport and demonstrate novel detection, remediation, and mitigation capabilities
- Real-time detection and discrimination methodologies for explosives and mature active range ordnance impact assessment and positioning system
- Tools and guidance to anticipate and adapt to climate change

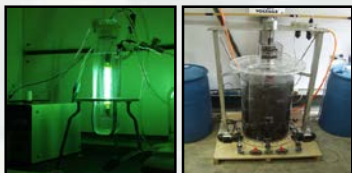
Payoff

- Sustain training facilities and installations
- Provide cost savings through proactive environmental management of new military materials
- Reduce environmental liability and regulatory constraint
- Improve the speed and safety for fielding new material
- Proactive material and chemical design through early testing of hazard effects

Military Materials in the Environment Science to Solution



Identified and sequenced genes of novel bacteria KTR9 to degrade RDX in soils



Electrochemical reduction of RDX in wastewater at Holston AAP; Allowing continued production



Lime technology for reduction of explosives, Redstone Arsenal

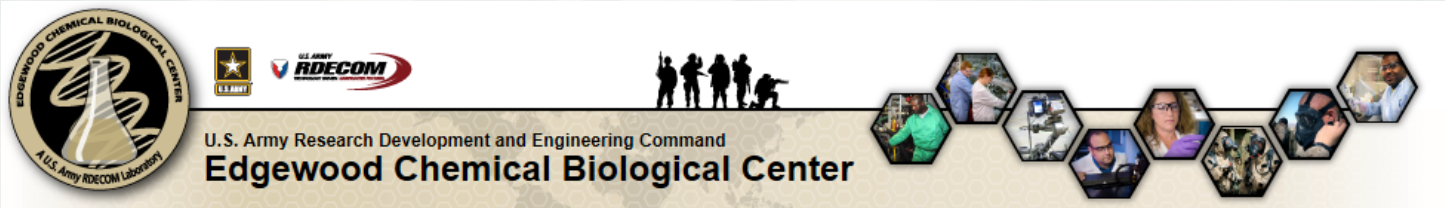
Developed a dual sensor handheld detector for UXO in rough terrain



Developed novel small arms range catch-box material to control lead run-off. Provided scientific assessment of tungsten/nylon bullet preventing costly acquisition action



Provided low cost procedures for managing catch-box material for DU ranges; APG DU catch-box meets NRC compliance, testing allowed



- Nation's principal research and development resource for non-medical chem-bio (CB) defense.
 - ▶ Toxicology of NTEs
 - ▶ CBRN
 - ▶ Environmental toxicology
 - Decontamination agents
 - Explosives in soils
 - Aquatic toxicology



Naval Medical Research Unit Dayton (NAMRU Dayton)



Naval Medical Research Unit Dayton

NAMRU Dayton Mission Statement

To maximize warfighter performance and survivability through premier aeromedical and environmental health research by delivering solutions to the field, the Fleet and for the future.



Mission of the Environmental Health Effects Research Directorate of NAMRU Dayton

To conduct basic and applied toxicology research to assess the risk, or reduce uncertainty in the risk, posed to Department of Defense (DoD) personnel (military and civilian), as well as civilian populations, that are potentially exposed to chemical contaminants and certain physical agents associated with DoD systems and operations.





Recent Contributions/Efforts

Naval Medical Research Unit Dayton

- ▶ Toxicity evaluation and biomarker identification in rats exposed to burn pit emissions and respirable SW Asian particulate matter. JPC5 Sponsored (Tri-Service Project). FY14-15.
- ▶ Identification of cytokine and miRNA-based biomarkers indicative of neurological effects due to jet fuel exposure. JPC5 Sponsored (Tri-Service Project). FY14-15.
- ▶ Development of environmental health guidelines for insensitive munitions (IMX). USAPHC Sponsored & Collaborative Project. FY15.
- ▶ Relationship between inhalation toxicity and non-constant concentration-time profiles. Sponsored by DTRA via ECBC. Collaborative Project with Army. FY13-15.
- ▶ Inhalation toxicity studies in rats and mice for PolyAlphaOlefinic (PAO) fluid. Sponsored by USAF 711th HPW/RHDJ, Collaborative Project, FY15-16.
- ▶ Evaluation on the effects of altitude, high oxygen concentration and volatile organic compound exposure on neurophysiology in rats. Sponsored by USAF 711th HPW/RHDJ, Collaborative Project, FY14-16.
- ▶ Cytotoxicity of nano-sized dental materials and air quality in Area Dental Laboratories. Sponsored by BUMED in collaboration with NAMRU-San Antonio, FY15.
- ▶ PBPK modeling of inhaled nanoparticles. Sponsored by NIOSH. Collaborative Project. FY13-15.
- ▶ PBPK model development for metals (consulting role). Sponsored by USACEHR, FY16.
- ▶ Role of matrix metalloproteinase-3 in deployment-related pulmonary fibrosis. Sponsored by CDMRP, Collaborative Project with National Jewish Health. FY17-19.
- ▶ Mechanisms and treatment of deployment-related lung injury: Repair of the injured epithelium. Sponsored by CDMRP, Collaborative Project with National Jewish Health. FY17-21.
- ▶ *In vitro* toxicity of nanoparticles for photodynamic therapy against combat-associated bacterial and fungal pathogens. Sponsored by MIDRP via NMRC, Collaborative Project, FY16.



Naval Medical Research Unit San Antonio (NAMRU-SA)



MISSION STATEMENT

Conduct medical, craniofacial, and biomedical research, which focuses on ways to enhance the health, safety, performance and operational readiness of Navy and Marine Corps personnel and addresses their emergent medical and oral/facial problems in routine and combat operations.

RESEARCH INITIATIVES

- Integrated research focused on innovative solutions to address craniofacial injuries, dental needs and related environmental stewardship.
- Research that focuses on developing novel treatment methodologies and testing of medical devices and agents that save the lives of warfighters and extends survival one golden hour at a time.
- State-of-the-art surgical and laboratory support for research investigations.

CO: Elizabeth A. Montcalm-Smith, CAPT, MSC, USN XO: Barry D. Adams, CAPT MSC, USN;
Funding through BUMED, WUN G1016



Contributions to TSTC

- **Provided briefings on Navy efforts to prepare for pending EPA rule which would require dental amalgam separators in dental clinics.**
 - Current studies test and evaluate chairside amalgam separators for environmental contaminant removal by testing filtered effluents for metals (Hg, Cu, Ag, Sn).
 - Clinical studies are also underway to establish effective lifetime of ISO-tested, commercially available dental amalgam separators in high-volume clinics.
- **Presented pilot data from air quality studies investigating the prevalence of nanoparticles in area dental laboratories (ADLs).**
 - An initial survey of ADL air revealed the presence of nanoparticles.
 - Characterization by transmission electron microscopy demonstrated their composition to be consistent with known dental materials.
 - *In vitro* data suggest that material size, concentration, and composition may drive pulmonary cell toxicity, but occupational exposure risk assessments cannot be made until more data on quantities of nanoparticles in ADLs are available.

NAMRU-SA Collaborators:

- Wright Patterson AFB (Dr. Saber Hussain)
- NAMRU Dayton (LCDR Carlis Brown)
- Army Engineer Research and Development Center; Environmental Lab (Dr. Jessica Coleman; pending MOA)



Tri-Service Toxicology Consortium: Coordination Across Services



NAVY AND MARINE CORPS PUBLIC HEALTH CENTER
PREVENTION AND PROTECTION START HERE

WWW.NMCPHC.MED.NAVY.MIL

Navy and Marine Corps Public Health Center: Mission

Navy and Marine Corps Public Health Center (NMCPHC) provides worldwide Force Health Protection services to Naval and Joint forces in support of the National Military Strategy.

- NMCPHC Environmental Programs Department supports a wide range of environmental and medical programs, issues and customers, worldwide. Support includes providing subject matter expertise in investigating, assessing and reporting potential human health risks for hazardous substances in the environment; review of chemical and site-specific risk assessments; risk communication consultation and training; health and safety consultation for health and safety plans/accident prevention plans; and toxicological consultation for emerging contaminants and health hazard assessments. NMCPHC readily provides a multi-disciplinary public health approach to programs supported to include risk assessors; risk communicators; preventive medicine and environmental and occupational health physicians; industrial hygienists; sanitarians; epidemiologists; entomologists; radiation health specialists and toxicologists.



NMCPHC's Recent Activities Through the Tri-Service Toxicology Consortium

- Vapor Intrusion of Trichloroethylene: Working with other Services to reconcile EPA and OSHA 10,000-fold difference in OELs. Provided table of different conclusions by expert panels on experiment on which EPA's analysis depends; 3 decades of evaluation of regulatory analyses of TCE.
- Exposures to PFCs/PFASs in water at or below EPA's Health Advisories: Chairing workgroup that is examining routes of exposure other than drinking, e.g., breast feeding, bathing, food (vegetables, eggs, and milk from nearby farms).
- Review of evaluation of potential exposures to lead: Analyses of firing ranges and submarines.
- Discussion of ongoing Army research: Proposed a more accurate alternative method for evaluating potential effects on male offspring of rodents (nipple retention) exposed in utero to estrogen-like chemicals.





Aerospace Toxicology US Air Force Research Lab



Mission: To optimize warfighter performance through aerospace toxicology, nanoparticle, and molecular cognition research



Vision: Eliminate human mission degradation through research to support the warfighter

Research Programs

Aerospace Toxicology

Nanomaterials Toxicology and Effects (Nanobioeffects)

Molecular Cognition

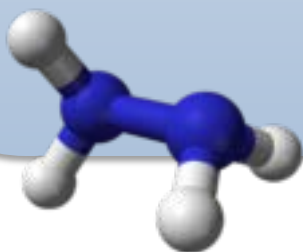


Toxicology:

Past AF efforts, programs & projects



- Hydrazine, propellants and hydrazine analogues
- Trichloroethylene
- Toxicity of burned composites
- Perchlorate
- Aluminum nanotoxicity for use in light
- Jet fuel induced hearing loss
- Jet fuel toxicity- JP-4 to JP-8 conversion
- Chromate consultation

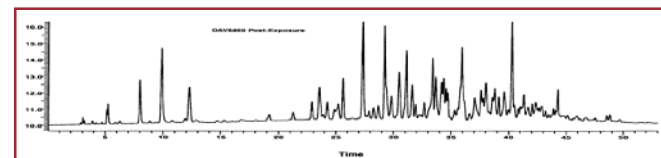




Major Current Efforts



- Develop warfighter-centric aerospace toxicology program
- Weapon system acquisition toxicology support
 - F-22, F-35, KC-46
- Toxicology consultative support for aircrew oxygen systems
 - OBOGS, bleed air: F-22, F-35, F/A-18, B-52
- Current research projects
 - Alternative jet fuels toxicity
 - Jet fuel induced hearing loss
 - Effects of exertion (high g-load) on toxicity
 - Effects of low oxygen (altitude or OBOGS air) on toxicity





Other Air Force Toxicology Entities



- **Air Force School of Aerospace Medicine**
 - **Occupational and Environmental Health Department**
 - Occupational chemistry
 - Industrial hygiene
 - Radiation health
 - Environmental risk assessment
 - Dosimetry, bioenvironmental engineering
 - ESOH service center
 - **Research Department**
- **Air Force Civil Engineer Center**
 - **Environmental compliance and restoration**

- Physiologically-based Pharmacokinetic Model for Insensitive Munition Compounds
- ATSDR Toxicology Profile Review
- NAS/COT Project Review
- Toxic Load Model (Haber's Rule evaluation)
- Toxicity Evaluation & Biomarker Investigation in Rats Exposed to Burn Pit Emissions & Respirable Mid-East Sand
- Comparison of perchlorate and periodate developmental effects in amphibians
- Investigation of interactions between the human microbiome and threat chemicals
- Identification of Cytokine and mRNA Biomarkers Indicate of Neurological Effects from Exposure to Jet Fuels
- Establishment/validation of Lead PBPK Model, testing and Evaluation
- Develop Pb Air Values for Military Personnel
- Development of Occupational Exposure Levels for TCE
- Cockpit exposure reconstruction via PBPK modeling for high performance aircraft respiratory symptoms
- Cognitive effects of low-level isopropanol exposure
- Predictive toxicology toolbox build

Questions?