DTRA.mil in the News

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Stick and Stay on Mission



Doing the Dirty Work

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DTRA MISSION

DTRA enables the Department of Defense (DoD), the U.S. Government, and international partners to counter and deter weapons of mass destruction and emerging threats.

CHEMICAL AND BIOLOGICAL TECHNOLOGIES DEPARTMENT MISSION

Lead DoD science and technology to enable the Joint Force, nation, and our allies to anticipate, safeguard, and defend against chemical and biological threats.

DEFENSE THREAT REDUCTION AGENCY

Research and Development Directorate Chemical and Biological Technologies Department Joint Science and Technology Office for the Chemical and Biological Defense Program

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Front cover: U.S. Marines with the 7th Engineer Support Battalion (7th ESB), 1st Marine Logistics Group, demonstrate proper vehicle decontamination during an exercise at Marine Corps Base Camp Pendleton, Calif. The 7th ESB conducted the exercise to sharpen the Marines' skills decontaminating tactical vehicles that are exposed to chemical, biological, radiological, and nuclear contaminants. (U.S. Marine Corps photo by Lance Cpl. Betzabeth Y. Galvan)

Inside cover: U.S. Army Capt. Joyce Avedisian, 14th Civil Support Team nuclear medical science officer, prepares to conduct sample analysis on suspected fentanyl in an Analytical Laboratory System vehicle. (U.S. Air National Guard photo by 2nd Lt. Steven Tucker)

Back cover: Test players in Level 4 Mission Oriented Protective Posture gear advance to treat simulated casualties at Camp Bullis, Texas. (Photo by Jose Rodriguez)

STICK AND STAND STAND (ON MISSION)



Military personnel and chemical incident responders use naloxone hydrochloride injections when they suspect high-potency opioids are being used as a chemical weapon. (Kaléo photo)

This disposable tool could neutralize extremely potent weaponized opioids.

he U.S. Food and Drug Administration recently approved an auto-injector for a single 10mg dose of naloxone that provides the Joint Force with an emergency medical countermeasure to protect against synthetic opioid intoxication. Previous treatment options were in 0.2mg, 0.4mg and 2.0mg doses. This 10mg naloxone dose is both a pre-exposure protection and post-exposure treatment for highly potent synthetic opioids such as fentanyl that can be 50 to 100 times stronger than morphine. The Defense Threat Reduction Agency's (DTRA) Chemical and Biological Technologies Department in its role as the Joint Science and Technology Office (JSTO) for the Chemical and Biological Defense Program invested in research by the U.S. Army Combat Capabilities Development Command Chemical Biological Center (USA DEVCOM CBC) and U.S. Army Medical Research Institute of Chemical Defense (USAMRICD). The Joint Program Executive Office for Chemical, Biological, Radiological, and Nuclear Defense used this research to support the Kaléo pharmaceutical company in developing this quick and easy way to administer the treatment for synthetic opioid intoxication.

This research also provided an understanding of the toxic threat posed by synthetic opioids to researchers, developers, customers, and stakeholders, who:

- Determined the duration of exposure risk in indoor and outdoor environments
- Assessed the consequences of a variety of dispersion methods
- Identified the signs and symptoms of incapacitating and lethal doses



Lethal doses of fentanyl and carfentanil relative to a lethal dose of heroin. (U.S. Drug Enforcement Administration photo)

Having both the Kaléo 10mg auto-injector and the naloxone multi-dose vial currently in development should enable medical planners and combat medics to decrease logistical burden and increase treatment flexibility.

DTRA JSTO's Chemical Medical Countermeasures Team at USAMRICD managed further research that explored the effectiveness of commercially available opioid medical countermeasures, including naloxone and naltrexone, to prevent respiratory collapse or death, and determined doses that would allow the Joint Force to maintain operational and cognitive capability. In the future, having both the Kaléo 10mg auto-injector and the naloxone multi-dose vial currently in development should enable medical planners and combat medics to decrease logistical burden and increase treatment flexibility, which illustrates DTRA JSTO's capabilities to develop technologies to better protect the Joint Force, nation, and our allies.

Researchers are developing an Autonomous Decontamination System that will make decontamination processes safer and less burdensome for the Joint Force.

DOING THE

o reduce manpower requirements and the risk to the Joint Force for thorough equipment and vehicle decontamination, researchers are developing autonomous robotic systems that can identify and map chemical or biological warfare agent (CWA/ BWA) contamination on surfaces, then decontaminate the surfaces, and clear a vehicle for unrestricted use.

After being contaminated with CWA/BWA, large equipment must be thoroughly decontaminated to the lowest field-detectable level for it to be cleared for safe, unrestricted operations. These decontamination operations require a large, designated area, immense logistic support such as water and decontaminants, and intensive manpower. There is also the risk of spreading contamination during decontamination operations.

The Defense Threat Reduction Agency's (DTRA) Chemical and Biological Technologies Department in its role as the Joint Science and Technology Office (JSTO) for the Chemical and Biological Defense Program is working with researchers to develop autonomous systems for next generation decontamination. Researchers from the U.S. Army Combat Capabilities Development Command Chemical Biological Center (DEVCOM CBC), Ground Vehicle Systems Center (DEVCOM GVSC), and Army Research Laboratory (DEVCOM ARL) are developing an Autonomous Decontamination System (ADS) for equipment and wide-area decontamination.

ADS will benefit the warfighter by reducing the troop-to-task burden, personnel requirements, time, and resources associated with current decontamination operations.

The ADS will be an interdependent system-of-systems that integrates:

- Autonomy
- Contamination mapping
- Information-enabled precision
 decontaminant application
- Clearance assurance technologies

ADS will integrate with a broader contamination management system, which includes a contamination-mapping datahandoff process that will identify and digitize contamination, making it available to the Joint Force on the network for decontamination tracking and clearance. ADS will benefit the warfighter by reducing the troop-to-task burden, personnel requirements, time, and resources associated with current decontamination operations.

The ADS will be a robotic platform based on the Multi-Utility Tactical Transport – eXpanded Mobility (MUTT-XM) Utility Ground Vehicle produced by General Dynamics Land Systems (GDLS). DTRA JSTO and DEVCOM CBC recently procured a MUTT-XM system as the platform for the ADS with a



The Small Multipurpose Equipment Transport (S-MET) is the developing platform for the future autonomous decontamination system. (U.S. Army Acquisition Support Center photo)

commonality of systems strategy that uses a single base system to support multiple Department of Defense missions.

Two supporting technologies are already developed: the Contamination Indicator Decontamination Assurance System (CIDAS) for contamination mapping of CWAs, and Sprayable Decontamination Slurry for equipment surface decontamination. The ADS-based MUTT-XM robotic platform (with autonomy kit) will include:

- Payload and subsystems
- Contamination indicator subsystem that employs CIDAS
- Contamination mapping subsystem that creates 2D/3D digital maps of positive indication of CIDAS spray
- Ability to relay this digitized data to a control center
- Robotic arm applicator for employing CIDAS spray and an advanced decontaminant

The size, weight, and power implications of integrating multiple subsystems onto one robotic platform will be examined during early prototyping and experimentation efforts over the next two years. Future development plans

Read more about the existing technologies that support autonomous equipment decontamination:



include subsystem transitions, advanced demonstrations, development of new doctrine and training, and full system transition soon after.

Current U.S. Army doctrine for thorough equipment decontamination demands heavy labor and logistics support. The ADS based on the MUTT-XM will benefit the Joint Service by enabling autonomous decontamination for mission critical equipment, air platforms, and ground platforms. It will mitigate chemical, biological, radiological, and nuclear contamination using multiple, scalable processes that reduce the hazard, manpower, and time and resources, and increase commanders' flexibility to support multi-domain operations. This is another technology developed by DTRA JSTO to detect, deter, and defeat chemical and biological threats against the Joint Force, nation, and our allies.

JST Oin the News

Seeing Red Reduces Time and Cost of Blister Agent Decontamination CIDAS, JITN July 2017, Vol 7, No 7

Click here to learn more

Sprayable Slurry Offers the Missing Piece of Decon Puzzle

ClearDecon, JITN January 2019, Vol 9, No 1

Click here to learn more

Put to the Test

CBOA 21, JITN November 2021, Vol. 11, No. 9

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CIDAS mapped chemical agent contamination on an M113 armored personnel carrier. (Left) CIDAS was used to identify areas of surface contamination on a vehicle. Areas with positive CIDAS signal are shown by a red dye, as seen by the human eye. (Right) Artificial intelligence computer vision algorithms are under development to automatically recognize the positive CIDAS signal and create a 2D and 3D digital contamination map on the vehicle surface. The contamination map is indicated by the purple overlay on the image and the map can be shared across tactical networks to confirm vehicle decontamination and clearance. (U.S. Army Acquisition Support Center photo)



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Within the Defense Threat Reduction Agency's Research and Development Directorate resides the Chemical and Biological Technologies Department performing the role of Joint Science and Technology Office for the Chemical and Biological Defense Program. This publication highlights the department's advancements in protecting the Joint Force and citizens from chemical and biological threats through the innovative application of science and technology.

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